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MODERNIZING AN ARSENAL

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During the fall of 1934 an appropriation of about $2,000,000 was made available to the Army Ordnance Department for the replacement of obsolete machine tools at manufacturing arsenals. The plan was to obtain the more urgently needed units which could not be procured from direct savings on current production, but which were necessary to maintain the standards of accuracy required in ordnance manufacture.

It may be of interest to the machine tool industry to know some of the factors governing selection and procurement. The commercial manufacturing executive will appreciate the problems which have arisen in government plants in using this new equipment to the best advantage. It should be of concern to the casual reader, as a taxpayer, to learn something of his investment in national defense.

The general proposition can be considered in three phases: first, selection, specification and procurement; second, the application of the equipment to the work at hand; and, finally, the effect of modernization of a government manufacturing plant on its emergency mission.

THE DIRECTIVE under which this procurement program was initiated called for the preparation of a list of machines and essential plant equipment which could not be financed out of current manufacturing appropriations, because of the small quantities of material normally produced. The selection of equipment was to be made with a view to its current utility and also its probable value in the national defense program.

To the industrial shop superintendent the determination of machine tool requirements may not be complicated, except as to actual selection. To the arsenal commander, however, the problem involves considerations most of which are indefinite and problematical.

The first questions which arose concerned the implication of the instructions. Should modernization consist only of replacing worn-out equipment with new units of similar characteristics and uses? If so, what should be the basis of determining serviceability of items? Does the program contemplate merely the rejuvenation of equipment for an average current production schedule, or does it actually mark the preliminary step in the complete modernization of the entire establishment, based on its war time mission? If an extensive modernization program is being started, should modernization of methods be considered, involving machines of radically different types from those now used? The list of equipment should be adjustable to the amount of the funds without radical revision.

The personnel responsible for planning a modernization program at an arsenal are those who happen to be on duty at the establishment at the time. Assignments of officers are designed to qualify them successively for higher administrative responsibilities in the Department as a whole. The functions of the Ordnance Department include, in addition to manufacturing, design, field maintenance, storage and issue, each having its importance in the national defense scheme. The arsenal commander, and especially his assistants, may have had less service at a particular establishment than those holding corresponding positions in industry. These officers, therefore,

must rely to a large extent for detailed information on their civilian assistants, whose service is more or less continuous, and whose memories are excellent. The experience of these civilian assistants is necessarily limited to a knowledge of methods and machines in the plant where they have grown up. Legal restrictions on appropriations prevent them from attending meetings, exhibits and conferences at government expense. Low salaries, compared to those of persons of corresponding responsibilities in civil occupations, discourage them from attending these educational activities at their own expense.

A manufacturing arsenal must never lose sight of its wartime mission. The production of material for current use is not less important than keeping alive the art of manufacture of those items which are not normally produced commercially. In time of peace, with one or two exceptions, the government arsenal is essentially a jobbing shop. It must undertake any project which may arise, to keep a nucleus of its force employed, and to develop experimental material. In time of war, it will become strictly a production plant with a very definite quantity and time schedule. Obviously, the type of equipment suitable for these two programs is vastly different, and some compromises must be made.

The Plant

Application of the theoretical analysis to the actual case required a survey of the plant, its personnel and its function. The Watervliet Arsenal, for example, had received almost no new equipment for 15 years. With a few minor exceptions, machines were of World War vintage, or earlier. Many of these had become "unserviceable through fair wear and tear incident to the service." Practically none had ever possessed the inherent accuracy required for producing modern ordnance material.

There had been no definite program for replacement of equipment. Financial regulations prevented establishment of a sinking fund for the express purpose of replacing obsolete machines. Records of performance or adaptability of specific machines for the work involved were extremely limited, or entirely lacking. Records of repair costs are available, but are not designed for analyzing machine performance.

The training and development of personnel, of necessity, has involved making the best of bad equipment. It is remarkable to note how skilled government machinists can produce work to far closer limits of accuracy than the actual variations in machine unit alignments by the habitual use of dial indicators. While this practice develops superior machinists, it is inefficient in that it requires higher class personnel than would be needed to perform the same job with suitable equipment. It increases production time due to the extreme care and frequent checking required to operate a machine which can not be relied upon.

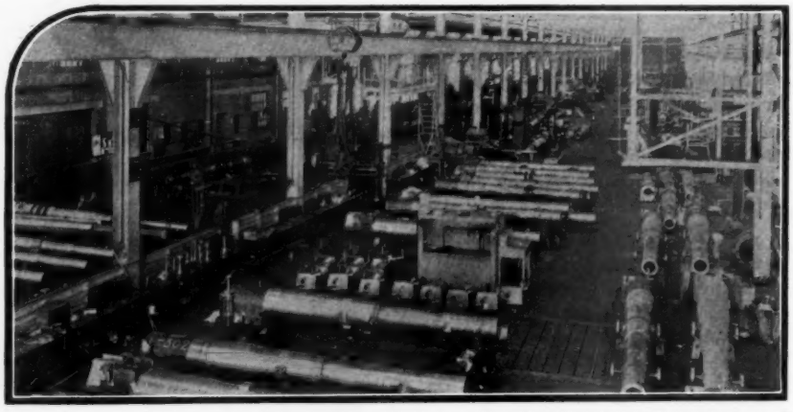
The Watervliet Arsenal is equipped for the machining and assembling of guns from the 37 m/m or "one pounder," to the 16-in. 50-caliber, with their breech mechanisms. In recent years developments in product have increasingly taxed the capacities of equipment and the ingenuity of shop personnel. Anti-aircraft developments are calling for longer guns in relation to caliber. Mechanisms are becoming more complicated and individual parts larger and heavier. Designers are becoming more confident that no machining operation is impossible. Accuracy limits are narrowing. Newer materials are appearing to a greater extent, principally Monel metal, stainless steels, and light weight alloys. Tool and fixture equipment is becoming more necessary to insure interchangeability and reduce cost of future manufacture. These trends must be recognized in procuring new machinery today to last perhaps 15 years.

Selection

In making selection of specific items, the state of development of the machine tool industry at the time of procurement required consideration. Machines of similar capacity differed widely in lateness of design because various builders had started to modernize their lines at different times. Approximate price ranges were needed to establish priorities and to adjust lists of requirements to funds available.

Actual inspection of factories which had modern equipment was not generally possible, and visits to the plants of all manufacturers whose equipment might be considered were obviously impractical. Reliance had to be placed, therefore, on literature furnished in response to inquiries and to visits of sales representatives. The insufficiency of industrial contacts was further emphasized by the attitude of industry prior to this program, for several perfectly natural reasons. Government purchases of standard machine tools had been rare, and methods of advertising furnished sufficient advance information to interested producers. Depression conditions required the machine tool industry to limit its sales contacts to cases in which an actual order was highly probable.

Consequently, the difficulty of obtaining a degree of familiarity with new machine tools adequate to the responsibility of actually specifying and procuring the quantity of equipment involved may be imagined.



Typical Watervliet Arsenal work

From the dealer's point of view, his advertising data and sales contacts represent his best effort to impress the customer with the value of his product. The customer, weighing information from several sources, can make five types of comparisons, and his decision is based on the relative impression these efforts make.

In the first type, data from competitive sources is compared. One extreme is represented by the highly colored artistic booklet in which illustrations are more impressionistic than accurate, and descriptions are impressive but technically incomplete. At

the other extreme, we find the plain but technically complete description and specification of the machine in all its details. Obviously, no true comparison from such literature can be made.

In the second comparison, information from one source is supplemented by the salesman. In addition to the comparative physiological effects of eye versus ear impressions, there is the psychological reaction of the customer to the personality of the salesman. The latter may or may not be able to compete with adequate literature, but he does supplement his own data by discussion and explanation.

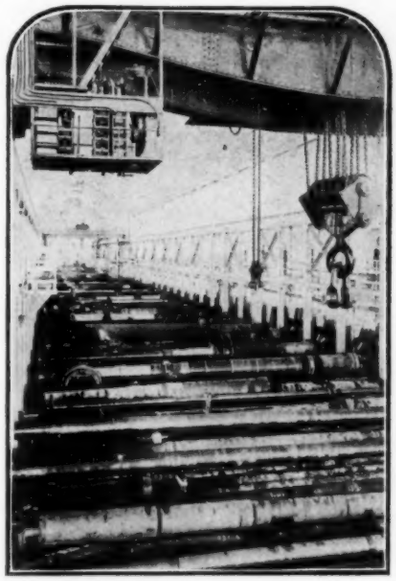
The third, fourth and fifth comparisons, salesman versus salesman, salesman versus engineer and engineer versus engineer, are variations of the personal contest. The more nearly equal competitive personnel may be in training, knowledge and personality, the more fair the comparison is likely to be. The customer, however, must know the technical problems of his own shop and the results expected from the machine in question. The manufacturer's representative should analyze the customer's requirements and be able to make intelligent recommendations from the customer's point of view. Inherent mechanical superiority of a machine does not necessarily indicate its economic advantage for the purpose under consideration. The selection resulting from these presentations will depend upon the relative ability and experience of the customer and of each sales representative involved.

In selecting a machine to be specified for government arsenal use, various considerations must be made which are not necessarily of importance to the commercial plant. Based on the arsenal's mission, the ideal machine must be of high quality to produce the accuracy requirements; highly versatile, for jobbing shop adaptability; sturdy, to withstand capacity overload without injury or loss of accuracy; simple to operate, to facilitate training of operators and to minimize spoilage of expensive work; and must be able to survive indefinite periods of idleness and insufficient maintenance without material deterioration, either in active buildings or in standby locations subject to radical temperature changes. Purchasing for long periods calls for consideration of the reputation and experience of the manufacturer and the probability of his continuing in business to provide for future maintenance when and if needed.

The commercial plant executive can select his equipment on the basis of financial return on a given job or in a given time. He has formulæ for computing indirect expenses affecting any piece of equipment and its earnings during its useful life. It is not usually purchased with the knowledge that it may be utlimately in standby or storage, for its commercial value depends upon the percentage of time it is operating. The government, while concerned with operating economy and efficiency, is not required to make a financial profit on manufacturing operations.

Specification

The legal requirements for government purchasing call for a full and complete description or specification of the item required to satisfy its actual needs, and the advertising of these needs so that all qualified makers or dealers handling the goods specified may bid. The intent of the law is to insure that the government will actually secure the best possible product for its investment, and to permit full and free competition from all acceptable sources.



Seacoast guns in process

The lowest money bid which satifies all of the specified needs of the government must be accepted. Where a bid other than the lowest is accepted, it must be evident from the data submitted that all lower bids actually do fail to meet these needs, and that the needs were positively stated or clearly implied in the specifications.

It becomes evident, therefore, that in order to protect the government, and at the same time to comply with the law, specifications must be so worded that the requirements of accuracy, durability, economy and longevity will be present in the articles offered.

Articles of the same basic characteristics and operating ranges vary widely in cost by reason of the quality of materials and workmanship, engineering skill entering into their design, and various other related factors. In any price range, a number of clearly defined price groups exist, determined approximately by quality.

There are many applications in the government and in industry satisfied by lower priced, average grade articles. Within this field, highest quality equipment usually will not be quoted, since a specification which can be met by low quality items automatically eliminates all high quality competition on the price basis alone. On the other hand, where highest quality requirements exist, all but the highest class equipment should be eliminated technically, by specification.

The specification of high class equipment raises several points for serious consideration. Quality can not be specified in any manner which will insure obtaining it. The statement that "quality articles are required" calls for a definition of quality, and an explanation of the manner in which it will be determined. Use of the words "highest quality" to indicate commercially recognized standards leaves the borderline cases for decision.

How to Get Quality

Certain manufacturers contend that a specification describing detailed characteristics of a particular make of machine is unjust and limits competition. This contention is not sound where the specification is worded to permit variation from explicit details, while accomplishing the results desired in an equally acceptable manner.

Attempts to devise a specification covering all the essential points of a group of high quality machines, without using exclusive features, have usually resulted in the presentation of a low priced item complying fully with the requirements as stated, but failing to meet the implied quality and experience standards.

It is felt, therefore, that the logical method of specifying high quality equipment is to select arbitrarily a typical, suitable unit of the group desired, and permit minor variations on the part of others within the group. Such a method insures high quality

offerings and permits high quality acceptance. It also permits the exercise of judgment on the part of the purchaser, who, in the last analysis, is responsible for obtaining an article which he can use satisfactorily. Any high quality bidders eliminated by this method would be automatically eliminated on price by a loose specification.

It has been contended that protective clauses, especially references to past performance, are successful in restricting bidding. While this may be true, it also bars recent modifications to high quality machines. In some instances, the successful bidder is forced to offer to the government an obsolete machine, or to increase his price to carry through one or two nonstandard items of an outmoded design.

Attempts have been made to specify accuracy. Here again such specification means nothing since any accuracy requirements can be met temporarily by suitable adjustments during inspection and test. No reputable maker will guarantee that his standard machine will retain extreme accuracy under all conditions for a year in the customer's plant while it is outside his own control, although he assumes that it will do so, and all concerned believe that it will.

Performance requirements have been mentioned as a means of obtaining suitable equipment. While this may be possible in certain instances, it is seldom possible in a government plant for general purpose machinery. Furthermore, except on an automatic machine, performance is a function of the operator's ability, day by day, which is again outside the manufacturer's control.

Procurement

After specifications have been prepared and bids submitted, their analysis and the determination of compliance with specifications is not entirely a routine procedure. The purely administrative details of bids are required to comply with legal regulations and to furnish a sufficient number of complete copies to maintain the prescribed files for future reference. These points are subject to clerical check. Complete data with bids is required in order that technical comparisons can be made. Articles which were not available for consideration before preparing the specification, must receive full analysis, together with more familiar squipment.

Since bids cannot be revised after they have been opened, they must be complete and accurate when submitted. Bids may be rejected as incomplete where information is not sufficient to permit definite comparisons or definite analyses to be made. This provision, however, does not permit rejection for purely arbitrary or personal reasons.

Analysis Essential

Where a bidder states that his article complies entirely with the provisions of a specification, it may appear that no analysis is required. It has been found, however, that through failure of the bidder properly to prepare his bid, or to analyze the specification, the article submitted does not so comply. Where a standard machine is called for, it is expected that a standard machine within the specified working range will be offered. Instances have occurred in which interlinear corrections or dimensional changes in a printed circular indicate that the machine offered is actually smaller and lighter than that contemplated, and that operating ranges will be extended simply for the purpose of meeting minimum specifications. Such bids fail to comply with the requirements of sturdiness, proportion, and ability to withstand overload, implied in a specification which calls for a standard machine.

Occasionally protests arise from those who have been unable to bid on a restricted specification, or whose bids may have been rejected on what they feel to be a minor technicality. Protests against exclusive specifications are usually illogical in that they assume the bidder to be better acquainted than the purchaser with the latter's requirements.

Restrictive specifications may be exclusive to one make of article, but where this is so, the features or capacity stated are required to satisfy actual needs of the government. Protests tending to influence the waiver of arbitrary terms of a specification in order to accept a lower bid, are unfair to all who have complied with the specification. Usually, those who comply could meet lesser requirements at a considerably lower price, and the order of acceptable bids would remain unchanged.

The fact that protests are made in government bidding tends to dampen the ardor of some of the officials charged with specifying and procuring equipment. It is sometimes difficult to explain reasons for a choice which may be based on intuition or informal knowledge rather than on recorded fact, and restrictive specifications which could be positively justified are avoided. Considering the responsibility placed on the government purchasing officer, the thoroughness with which he must do his job to escape the pitfalls of the law, and the fact that his future advancement is measured by past and present performance, it is surprising that he should not be accorded the same ability to exercise his judgment as is accorded the commercial plant official whose decision is final. The correctness of the judgment of the responsible official depends on the successful operation of the equipment he has chosen. The proper time to influence his judgment is before his conclusions are definitely formed, and the proper method is by definite engineering analysis of his needs.

The Human Factor

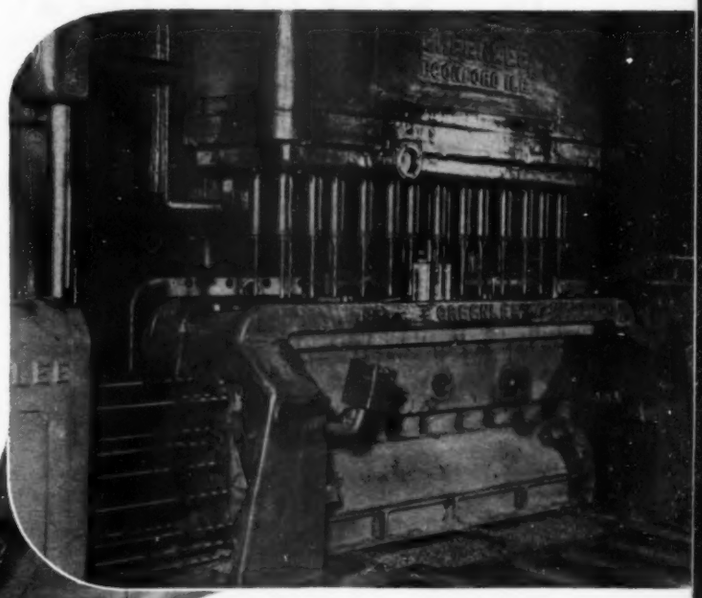
It is possible to return again to a point of similarity between the industrial plant and the government arsenal when final selections have been made and the new equipment received and installed. Selection has been based on theoretical analysis and comparative data rather than on actual operating facts. The particular machine obtained may not be the make which has been selected because of conditions outside the control of the shop, or the actual machine delivered may differ from that selected from data in a manner not evident from theoretical analysis. The receptiveness of operators and shop supervisors affects the productivity of the machine, and this personal attitude is actually beyond the control of the management. The production records are the only indication of the correctness of the selection. On them the management must rest its case.

Modernization cannot stop with securing the modern units if the hoped for results are to be obtained. Revised thinking is needed on the part of operators to take advantage of increased efficiency of modern equipment. Revised methods in design, planning and routing must follow. The more extensive the modernization program, the more slowly are its advantages realized. The need, therefore, is not for gradual replacement of obsolete units, but for prompt and active efforts to reach the current development of the machine tool industry, and for a continuing policy which will take full advantage of future improvements as they occur.

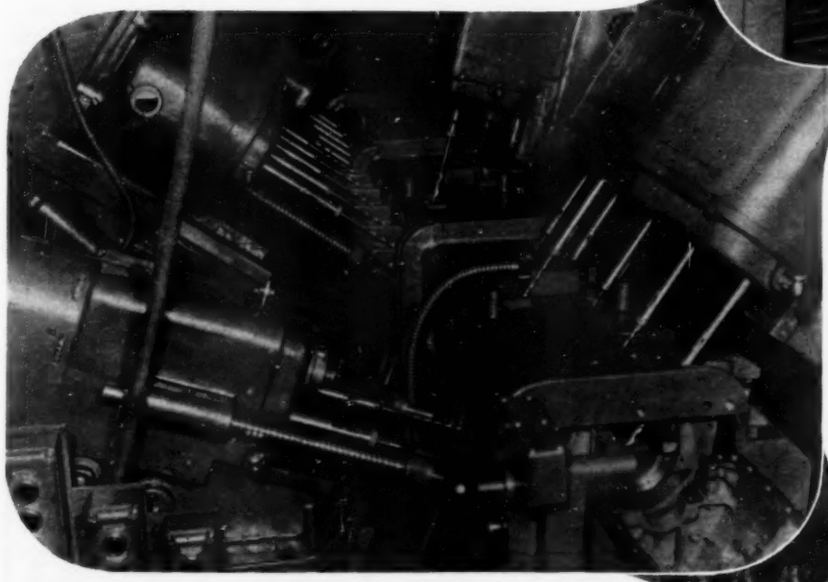
Part II—Application of equipment to the work at hand; and *Part III—Modernization and the emergency mission,* will be published in subsequent issues.

MULTIPLE DRILLING SPEEDS BUICK BLOCKS

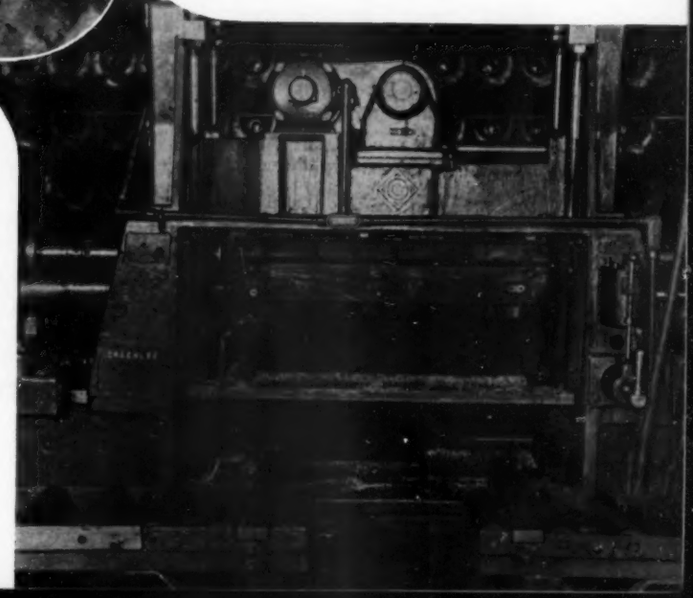
INCREASED efficiency and greater accuracy are being secured in machining cylinder blocks at the Flint plant of the Buick Motor Company, by the use of modern equipment. In numerous cases where separate machines were formerly employed for different operations, the work is now being done by a single machine with multiple-station equipment. This arrangement eliminates many variables which might be produced by moving the blocks from machine to machine and from fixture to fixture.



All angle holes are drilled, reamed and tapped or countersunk on this continuous three-station, 25-spindle machine. The block feeds right through the machine, eliminating heavy handling in loading and unloading. Operations include boring and counterboring the distributor mounting boss



The special machine shown above was developed to drill, ream and tap all vertical and horizontal holes in the Buick block. It is a two-way station unit, one station being shown in the illustration. Drilling only is done at this station, the reaming and tapping operations being performed later at the other station



Crank and cam bearings are finish bored simultaneously on a special horizontal borer. In addition to the main bearings, which are stepped in diameter from one end to the other, and the camshafts bearings, which are similarly stepped, dowel holes for the flywheel housing and the front engine support are reamed and the distributor hole is finish reamed and faced

In machining, the main bearings are held to 0.001 in., crankshaft bearing bores to 0.002 in., and all bearings to 0.001 in., for alignment

HEAT-TREATMENT IMPROVES SULPHUR SCREW STOCK

Correct carburization of high sulphur steel adds strength and toughness and makes available the advantage of machining at higher speeds

L. D. SPENCE and N. B. MAC LAREN
Brown & Sharpe Manufacturing Company

SINCE the introduction of high sulphur steel for the production of screw machine parts, the most serious drawback which has prevented a more general acceptance of this material has been the lack of a suitable method of heat-treatment. It is a well known fact that high sulphur steel in its natural condition is about ten per cent weaker than the ordinary cold-drawn steel screw machine stock of approximately SAE 1112 specification.

Even when given the customary heat-treatment, used for screw machine products made from ordinary cold-drawn steel, similar parts made from the high sulphur steel continue to show an inherent weakness. Consequently, in spite of the recognized production advantages of the high sulphur stock, the comparative weakness, both in its natural state and when heat-treated by ordinary methods, has prevented many manufacturers from adopting the high sulphur material. This has been true particularly for threaded parts where any reduction in strength is an important factor.

Prompted by the production advantages possible in the manufacture of parts from the high sulphur stock in both regular and high-speed types of automatic screw machines, the Brown & Sharpe Mfg. Company conducted a series of experiments in an effort to discover the method of heat-treatment that would improve the physical properties of the high sulphur steel. After considerable investigation, a cold-drawn steel of high sulphur content of the following specifications was adopted: carbon 0.08-0.15, sulphur 0.22-0.30 and manganese 0.75-0.90, the steel of this analysis giving very desirable free-cutting qualities.

The customary heat-treatment for parts made from cold-drawn steel approximating SAE 1112 follows:

Heat-Treatment A

Carburize at 1600 to 1650 F. Cool in pots. Reheat at 1550 to 1600 F. Quench in oil. Reheat at 1400 to 1425 F. Quench in brine.

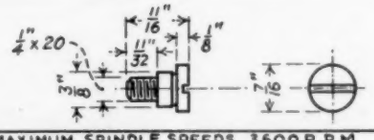
This treatment provides refinement of both core and case and has been found to give the best combination of case hardness and impact. When high sulphur steel was given this heat-treatment, it was found that the relative weakness of the high sulphur stock was apparent. In other words, in its natural state, the high sulphur stock was about ten per cent weaker than the ordinary cold-drawn steel stock. When both stocks were given the above treatment, however, (quenched in oil after second reheating instead of in brine) the parts made from high sulphur steel were approximately seventeen per cent weaker as indicated

S.A.E. No. 1112 .....36.0 ft.-lbs.
High Sulphur .....29.7 ft.-lbs.

The tests were made with screws of ⅜-in. diameter and the results are given in ft.-lbs. of wrench torque.

From the numerous experiments conducted, the method of heat-treat-

FIG.1



		1,800 R.P.M. MAXIMUM SPINDLE SPEEDS 3,600 R.P.M.					
DATA		NO. 0 REGULAR				NO. 0 HIGH SPEED-30 SPEEDS	
MATERIAL		SCR. STK.-LOW SULPHUR CONT.		SCR. STK.-HIGH SULPHUR CONT.		SCREW STOCK HIGH SULPHUR CONTENT	
GROSS PRODUCT PER HR.		163		276		423	
STOCK SURFACE FEET		115		206		300	
THREAD " "		29		23		34	
OPERATIONS	FEED	SPINDLE R.P.M. FORWARD				SPINDLE R.P.M. FORWARD	
		988	445	1800	364	2630	530
CLEAR & CH. SP.		16		18		16	
THREAD		24	9	45	9	45	9
CLEAR & CH. SP.		20		18		20	
FEED STOCK		15		25		20	
FORM							
CUT OFF	.0005 .0005	287		284		271	
TOTAL REVS.		362		390		372	

Fig. 1—Free machining of high sulphur steel permits use of the maximum spindle revolutions of the regular machine (1800 r.p.m.); the high-speed machine permits a still greater gain in production

ment which gave the greatest increase in strength to the high sulphur steel with minimum distortion was as follows:

Heat-Treatment B

Carburize in bath or furnace at 1600 to 1650 F to provide a depth of case of 0.010 to 0.020 in. Quench in brine.

When applied to threaded parts, a drawing heat can be used to relieve brittleness of the threads. Not only did this heat-treatment materially improve the strength of the parts made from the high sulphur steel, but it also improved the strength of the ordinary cold-drawn steel parts by about 30 per cent over Heat-Treatment *A*. In a test made on screws, similar to those referred to above, which had been given Heat-Treatment *B* and then drawn to 600 F, the results were as follows:

SAE No. 1112.....47.6 ft.-lbs.
High Sulphur .....47.0 ft.-lbs.

It is interesting to note that with Heat-Treatment *B* the inherent weakness of the high sulphur steel has been lost so that the two steels have practically the same strength. Note also that the high sulphur steel is increased in strength over 50 per cent by giving the parts Heat-Treatment *B* instead of Heat-Treatment *A*.

While Treatment *B* is particularly desirable because it is suitable for threaded parts, other heat-treatments to suit varying conditions were used in the experiments and are given below:

Heat-Treatment C

Carburize at 1600 to 1650 F. Cool in pots. Reheat at 1400 to 1420 F. Quench in brine.

This gives a highly refined case, thus providing good wear. The core, however, is not refined and consequently the impact and toughness will not be as good as would be obtained from application of Heat-Treatment *A*.

Heat-Treatment D

Carburize at 1600 to 1650 F. Cool in pots. Reheat at 1550 to 1600 F. Quench in brine.

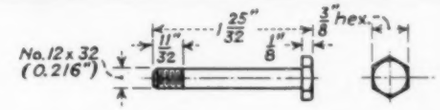
Some manufacturers may prefer this treatment because of their existing equipment since it gives strength comparable to that obtained with Heat-Treatment *B* although it may give greater distortion. The coarse grain of the case, however, will not give the resistance to wear as compared to Heat-Treatment *C*.

Heat-Treatment E

Carburize at 1500 F. Quench from pots into oil.

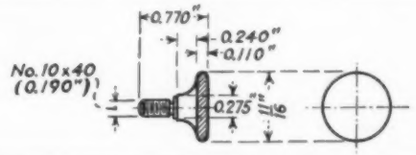
This treatment is desirable for relatively delicate parts because it tends to prevent cracking. It is commonly referred to as pack hardening and gives

FIG. 2



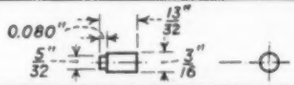
		1,800 R.P.M. MAXIMUM SPINDLE SPEEDS 3,600 R.P.M.					
DATA		NO. 0 REGULAR				NO. 0 HIGH SPEED-30 SPEEDS	
MATERIAL		SCR. STK.-LOW SULPHUR CONT.		SCR. STK.-HIGH SULPHUR CONT.		SCREW STOCK HIGH SULPHUR CONTENT	
GROSS PRODUCT PER HR		150		180		240	
STOCK SURFACE FT.-CORS.		160		206		298	
" " " -FLATS		140		177		255	
THREAD " "		38		46		30	
OPERATIONS	FEED	SPINDLE R.P.M. FORWARD				SPINDLE R.P.M. FORWARD	
		1474	663	1800	810	2630	530
INDEX TURRET		20		24		19	
TURN	.003 .0047	275		272		280	
INDEX TURRET-CH. SP.		20		24		19	
THREAD		50	23	50	23	115	23
CLEAR, I.T. & CH. SP.		35		36		36	
FORM							
CUT OFF	.0014	170		170		170	
FEED STOCK		20		24		19	
TOTAL REVS.		590		600		658	

FIG. 3



		1,200 R.P.M. MAXIMUM SPINDLE SPEEDS 2,400 R.P.M.					
DATA		NO. 2 REGULAR				NO. 2 HIGH SPEED-30 SPEEDS	
MATERIAL		SCR. STK.-LOW SULPHUR CONT.		SCR. STK.-HIGH SULPHUR CONT.		SCREW STOCK HIGH SULPHUR CONTENT	
GROSS PRODUCT PER HR.		80		120		180	
STOCK SURFACE FEET		142		236		320	
THREAD " "		17		25		32	
OPERATIONS	FEED	SPINDLE R.P.M. FORWARD				SPINDLE R.P.M. FORWARD	
		789	342	1200	519	1775	655
CUT OFF & FORM	.0015 .0008	419		404		386	
FORM							
BRING SW. TOOL IN POS.		61		61		56	
KNURL	.002	23		23		23	
INDEX TURRET, CH. SP.		15		24		17	
THREAD		44	18	44	18	48	18
INDEX TURRET, CH. SP.		15		20		15	
FEED STOCK		15		24		17	
TOTAL REVS.		592		600		592	

FIG. 4



		2,400 R.P.M. MAX. SPINDLE SPEEDS 5,000 R.P.M.	
DATA		NO. 00 REGULAR	NO. 00 HIGH SP.-30 SPEEDS
MATERIAL		SCR. STK.-LOW SULPHER CONT.	SCREW STOCK HIGH SULPHUR CONTENT
GROSS PRODUCT PER HR		1200	2400
SURFACE FEET		118	245
OPERATIONS	FEED	SPINDLE R.P.M. 2400 FORWARD	SPINDLE R.P.M. 5000 FORWARD
FORM	.0007	40	45
CUT OFF	.0015	56	56
FEED STOCK		24	24
TOTAL REVS.		120	125

Fig. 2—Only 206 surface ft. per min. could be used in turning this part in the regular machine; with the high-speed model the turning speed was boosted to 296 ft. Fig. 3—High sulphur stock permits a 50 per cent increase in production over ordinary low sulphur steel; and on top of this, the high-speed machine gives another 50 per cent gain. Fig. 4—Because of its small diameter, surface speed on this part is only 118 ft. per min. at the maximum speed of the regular machine (2,400 r.p.m.); obviously there is no advantage in using high sulphur screw stock with this machine. With the high-speed machine, however, the high sulphur steel permits a 100 per cent jump to 245 ft. per min.

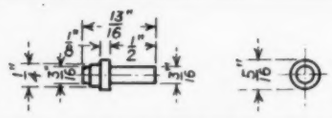
a hard case with partial case refinement although the strength and impact obtained are relatively low.

Because the freer cutting qualities of the high sulphur screw stock permit higher surface speeds for turning, forming, cutting-off and other operations on automatic screw machines, a noticeable increase in production was obtained in a "regular" Brown & Sharpe automatic screw machine over the best production obtainable with the ordinary cold-drawn or "low sulphur content screw stock" as shown in the examples, Fig. 1, 2, 3, 5, 6 and 7. When the same parts are made, however, on a Brown & Sharpe high-speed present-design machine of the same size, a decided increase in production is obtained, due primarily to the fact that the high-speed machines provide a suitable wide range of speeds and have a maximum spindle speed twice that of the regular machines; they provide any desired surface speed up to approximately 550 ft. per min.

An interesting comparison of production is given in Fig. 4 where the regular machine used ordinary screw stock of low sulphur content and the high-speed machine used the high sulphur stock. Note also in Fig. 7 that figures are given using both the low sulphur stock and the high sulphur stock on a high-speed machine for comparative purposes. In all examples shown, the same method of camming and the same feeds were used. In addition, it is interesting to note that in each of the examples, suitable spindle speeds were obtainable for all operations necessary to give the high surface speed at which the high sulphur screw stock is capable of being machined, yet, in only one case (Fig. 4) was the maximum speed used that is available in the machine.

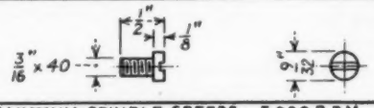
As a result of the observation by Brown & Sharpe Manufacturing Company of the production advantages of the high sulphur steel and of the discovery of satisfactory methods of heat-treatment, practically all screw parts formerly made at this plant from cold-drawn steel of SAE 1112 specification are now being produced from the high sulphur steel. Heat-Treatment *B* is used in the majority of instances, although frequently on screws and threaded parts a drawing heat is given to reduce brittleness of the thread.

FIG. 5



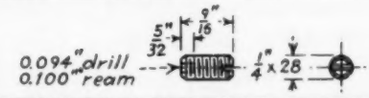
DATA		2,400 R.P.M. MAXIMUM SPINDLE SPEEDS 5,000 R.P.M. NO.00 REGULAR		NO.00 HIGH SPEED-30 SPEEDS
MATERIAL		SCR. STK.-LOW SULPHUR CONT.	SCR. STK.-HIGH SULPHUR CONT.	SCREW STOCK HIGH SULPHUR CONTENT
GROSS PRODUCT PER HR.		300	400	654
SURFACE FEET		143	196	300
OPERATIONS	FEED	SPINDLE R.P.M. 1748 FORWARD	SPINDLE R.P.M. 2400 FORWARD	SPINDLE R.P.M. 3641 FORWARD
CLEAR		18	24	10
TURN	.006	86	86	82
CLEAR		28	28	26
FORM	.0006	128	128	125
CUT OFF	.0015	72	70	71
FEED STOCK		18	24	20
TOTAL REVS.		350	360	334

FIG. 6



DATA		2,400 R.P.M. MAXIMUM SPINDLE SPEEDS 5,000 R.P.M. NO. 00 REGULAR				NO.00 HIGH SPEED-30 SPEEDS	
MATERIAL		SCR. STK.-LOW SULPHUR CONT.		SCR. STK. HIGH SULPHUR CONT.		SCREW STOCK HIGH SULPHUR CONTENT	
GROSS PRODUCT PER HR.		600		720		1028	
STOCK SURFACE FEET		150		177		305	
THREAD " "		39		45		42	
OPERATIONS	FEED	SPINDLE R.P.M. FORWARD 2048	792	2400	928	SPINDLE R.P.M. FORWARD 4264	852
CLEAR & CH. SPEED		14		14		13	
THREAD		46	18	46	18	90	18
CLEAR & CH. SPEED		17		20		14	
FEED STOCK		20		20		22	
FORM							
CUT OFF	.0015	108		100		110	
TOTAL REVS.		205		200		249	

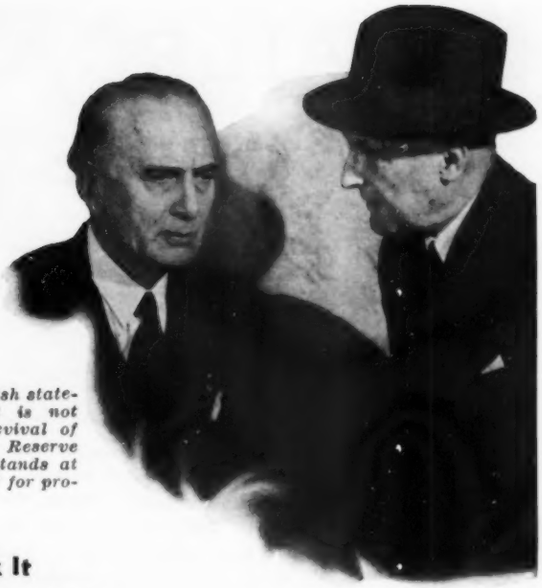
FIG. 7



DATA		2,400 R.P.M MAXIMUM SPINDLE SPEEDS 5,000 R.P.M. NO. 00 REGULAR				NO.00 HIGH SPEED-30 SPEEDS			
MATERIAL		SCR. STK.-LOW SULPHUR CONT.		SCR. STK.-HIGH SULPHUR CONT.		SCR. STK.-LOW SULPHUR CONT.		SCR. STK.-HIGH SULPHUR CONT.	
GROSS PRODUCT PER HR.		211		257		313		480	
STOCK SURFACE FEET		83		114		150		240	
DRILL " "		32		45		65		90	
THREAD " "		32		45		30		46	
OPERATIONS	FEED	SPINDLE R.P.M. FORWARD 1273	492	1748	675	SPINDLE R.P.M. FORWARD 2280	456	3641	727
CLEAR		13		18		18		18	
CENTER	.0015	31		33		32		31	
INDEX TURRET		14		18		14		18	
DRILL FORM	.0025	68		70		68		68	
INDEX TURRET		14		18		14		19	
REAM	.007	25		30		25		25	
INDEX TURRET-CH. SP.		14		18		14		19	
THREAD		52	20	52	20	100	20	100	20
CLEAR & CH. SPEED		21		28		24		24	
CUT OFF	.0015	95		105		114		113	
FEED STOCK		14		18		14		19	
TOTAL REVS.		361		408		437		455	

Fig. 5—When produced from steel of low sulphur content, this part, made from a $\frac{5}{16}$ in. bar, is machined satisfactorily at 143 ft. per min., well within the range of the regular machine. Some improvement in production may be gained by using high sulphur steel which allows using the maximum speed of 196 ft., but the greatest gain is realized with this material in a high-speed machine on which 300 ft. per min. can be reached. Fig. 6—Another example demonstrates the advantages of high sulphur stock on the high-speed machine; with small diameter bars the advantages of this combination are most pronounced. Fig. 7—As this part is threaded over stock size the design necessitates a high ratio between the threading speed and the surface speed of the stock. The high-speed machine contains two ratios between low and high speed—1:3 and 1:5. The piece shown was produced by using the 1:5 ratio, as may be noted by referring to the figure for the stock and threading operations. In this instance, the regular machine provides only a ratio of 2.6:1

Talking Shop



The New Dealers are taking seriously a facetious suggestion that business should "gang up" in self defense. But after all, as one of our unreconstructed friends remarks, what is wrong with ganging up against gangsters?

¾-Million a Day

Nearly three quarters of a million dollars a day, or some $225,000,000 a year, is being spent by the Class 1 railways of the U.S.A. on repair and servicing of locomotives. The authority is the report of Railroad Coordinator Eastman to the Association of American Railways. A saving of only five per cent would mean over $11,000,000 a year on this class of railways alone. And $11,000,000 would buy a lot of machine equipment that would save much more than the five per cent on which this estimate is based. Spread over a five year amortization period it would pay to spend over $50,000,000 for new equipment.

Industrial Conference Board estimates that industry could reemploy 2.8 to 3.3 millions if activity were at 1929 level. As this would take care of only 30 per cent of the estimated idle a couple of new industries would certainly be helpful if we could find them.

Luck in Birmingham

A bright spot in Birmingham trade is the manufacture of lucky charms, in which the enlightened people of England still seem to believe, according to *Industrial Britain*. Models of pixies, gnomes and hobgoblins, which are supposed to ward off bad luck and evil, or to bring good fortune to those who carry them, are today being sold by the thousands.

Tourists are bringing back quaint souvenirs from abroad as mementoes

of the holidays, and the more they bring back the more Birmingham makes. Birmingham-made souvenirs are on sale in every part of the world, even in the Fiji Islands. At least one firm within the past few months has been compelled to move into larger quarters to cope with expansion in this particular industry.

In contradiction of the rash statements that reemployment is not keeping abreast of the revival of production the Federal Reserve Board Index (1929-100) stands at 78 for employment and 74.7 for production.

Cheaper to Chuck It

It's hard for many to realize that it often costs more to repair such a thing as a globe valve or a carburetor in a small shop than a new one is worth. Where the time required in making it is often unbelievably small, the time of

taking it apart, making repairs and reassembling without special tools, runs into money.

Many repair shops do not charge the full time on a job of this kind but switch part of it to some big job that can stand it. Or else they take a loss hoping to make it up on a later job. If all shops would charge what such repairs are really worth they would encourage the purchase of new parts and save themselves a lot of grief.

Research pays. General Electric has just made a study which shows that the ratio between business done on new lines (less than 10 years old), and business done on old lines, was 18 per cent higher in the depression years, 1930-1934, than in the boom years, 1926-1930.

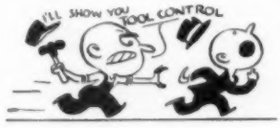
Micro-Setting

One of our old contributors, Martin H. Ball, suggests that we use "micro-setting" in place of the old, and not always understood, terms of "jogging" and "inching." The suggested name seems to fit all cases that come to mind. While we have rather overworked the term "micro," just as we have "matic," that is hardly an excuse for turning down what seems like a logical suggestion.

Tool Control

One of our readers, who admits he has had the misfortune to be born betwixt the cold and warm seasons, writes as follows:

"After reading Charles Weslow's brief but illuminating exposition of the 'cold month' theory of toolmaking



aptitude (*AM*—Vol. 79, page 366), I just cannot resist the impulse to suggest that *American Machinist* take the lead in a movement to produce more and better toolmakers. Why not inaugurate an educational campaign to induce the heads of families wherein mechanical inclination might be suspected to abstain from all activities during such portion of the year as might be calculated to be conducive to births in warm months?"

How to interest the rank and file in contributing to the "community chest" is a problem. A large Michigan corporation in a city of 80,000 found an answer a few weeks ago. It suggested that each employee voluntarily work half a day (Saturday morning) and contribute his wages. The management then agreed to contribute an amount equal to 50 per cent of the total turned in by employees.

—The Editors.

A RAILROAD SHOP TRIES the TORCH

JAMES GRANT

Superintendent of Motive Power,
Atlantic Coast Line Railroad,
Waycross, Georgia.

And finds 250 uses for oxyacetylene cutting, with new ones cropping up each day

MY FIRST recollection of the oxyacetylene process in a railroad shop was about 1911. At that time it was in its infancy—something we were afraid of because it seemed somewhat supernatural. It didn't stand to reason then that a little metal, puddled together with a blowpipe, could be as good as a blacksmith's weld. This aversion was evident for many years.

The oxyacetylene shape-cutting machine is a recent innovation in railroad and car shops. In a short period of time, we have developed its uses very rapidly, and each day we find some new operation that shows a saving.

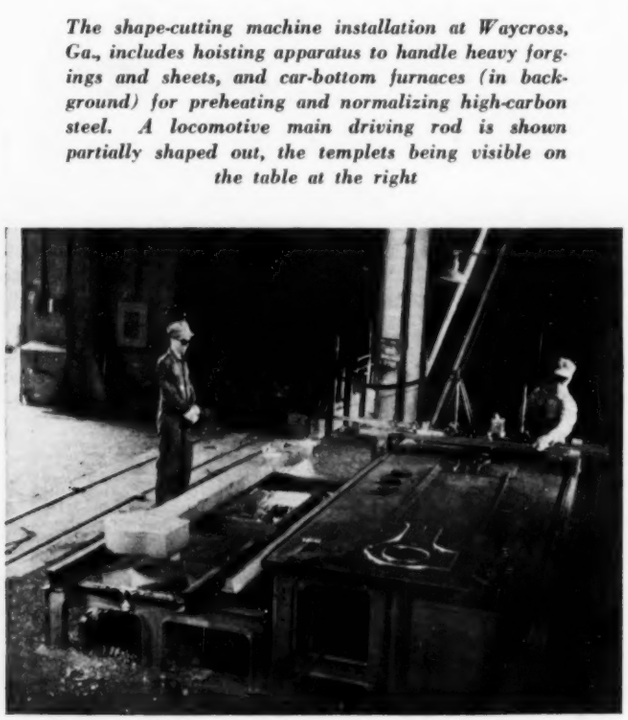
It is of vital importance in the installation of a shape-cutting machine that particular care be exercised in selecting the proper location. It should be right in line with the flow of the work, whether the finished material is to be used in the machine shop, car shop, boiler shop or some other department in the plant. The location should be convenient to the billet, bar, and plate storage racks and should also be in close proximity to the blacksmith shop, as much work for the shape-cutting machine comes directly from the forge shop. The blacksmith shop is not a good location for a shape-cutting machine. There is too much vibration caused by the steam hammers, and this is detrimental to the machine, prevents a proper set-up, and is likely to cause inaccuracies and grooving in cutting the metal.

It is important that the location be airy and well-lighted, have good crane service for handling the heavier work, and conditions should be comfortable for the operators. One end of a machine shop or erecting shop, provided sufficient space is available, can be considered an ideal location for the shape-cutting machine, but the choice depends on local shop conditions and the arrangement of the buildings.

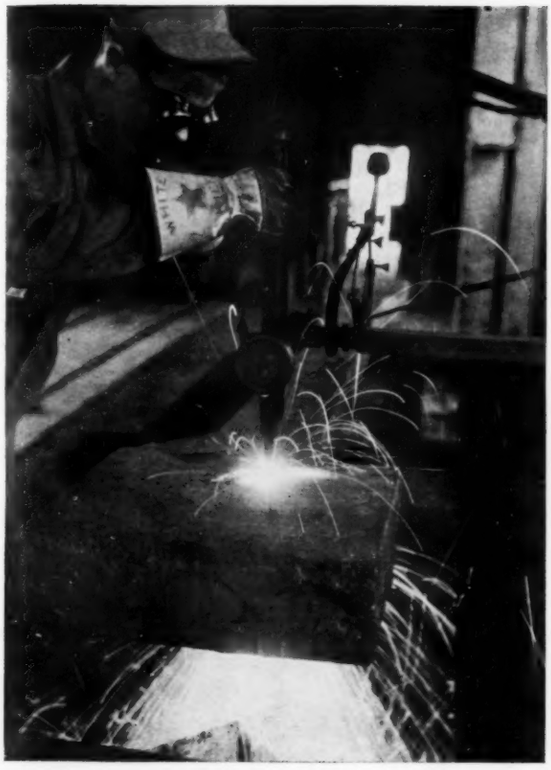
It is very important that the proper type of preheating and normalizing furnaces be installed. Where there is sufficient volume of work to keep the machine working on a 24-hr. basis, two furnaces make an ideal installation, one for preheating the work and one for normalizing. These furnaces should be as nearly air-tight as possible so that there will be very little loss in the carbon content of any of the shapes or forgings being prepared for cutting or being normalized. Operators should be instructed never to open the furnace

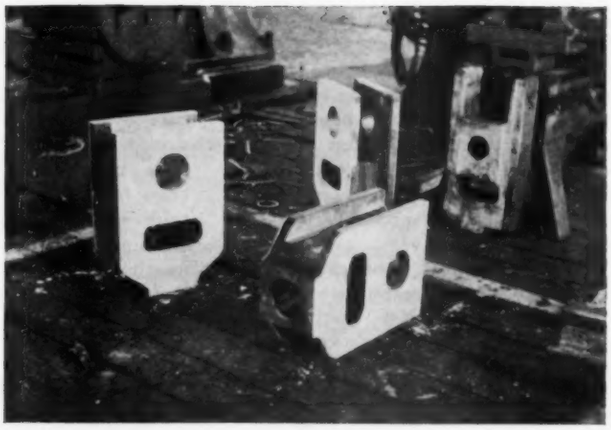
Read at the 36th Annual Convention, International Acetylene Association, Nov. 12-15, 1935.

The shape-cutting machine installation at Waycross, Ga., includes hoisting apparatus to handle heavy forgings and sheets, and car-bottom furnaces (in background) for preheating and normalizing high-carbon steel. A locomotive main driving rod is shown partially shaped out, the templets being visible on the table at the right



Profiling the end of a locomotive main driving rod is a rapid operation, and only enough stock is left for a light milling cut





Crossheads such as these are shape-cut eight at a time. The intricacy of the work requires an alert operator to produce four of them in an 8-hr. day

By cutting out the axle opening in the main driver rod with the torch, much time is saved because the material is high-carbon steel

doors except when necessary. If the furnaces are heated with oil, the burner selected must not be too sensitive, or likely to clog up and give trouble.

It has been found that the car-bottom furnace is the most suitable type for use with the shape-cutting machine. This furnace has a movable truck, lined and topped with firebrick, upon which the billets or plates are placed while being heated. This truck runs on rails and can be quickly pulled out or shoved back in the furnace without disturbing the temperature beyond a slight cooling-off from opening the door. It has been found desirable to arrange this truck so that it can be operated either by a horizontal air cylinder, or by an electric or air motor. Such devices help the operators to get out more work.

A convenient jib crane, or some other quick-acting crane equipped with either an electric or air motor hoist, should serve the furnace and the cutting table of the machine so that little heat is wasted between the furnace and the machine.

Care should be exercised in the selection of cutting machine operators and helpers. We find that young men who have had some experience either as blacksmiths or machinists generally make the best operators. A good welder does not always make a good shape-cutting machine operator. The operator must be alert, quick, and able to take advantage of the many short cuts in order to get production from the machine. He must also have a good education, be able to read blueprints without any assistance and thoroughly understand the heats required for the different metals that he shapes out. Above all, he should be progressive, as we may well say that the machine is still in its infancy, especially in locomotive and car shops. The operator should be able to make his own templets. The helper should be trained to take the machine at any time that the operator is absent from work.

It is important that all shape-cutting machine operators be specialized if we expect to get successful output. Many shape-cutting machine installations have been absolutely ruined by labor troubles, especially seniority agreements which have displaced competent operators. Once your shape-cutting machine operators and helpers have been thoroughly trained, do not under any circumstances allow other employees to displace them.

Following are some of the operations now performed by the shape-cutting machine in our locomotive and car shops. The manufacture of locomotive main rods and side rods has become a simple matter since the adoption of the cutting machine, costs being cut almost in half. These facts are taken from time studies and actual cost records. In the first place, the blacksmith work on a main rod is cut practically in half. It is necessary only to draw out the shank of the rod, leaving just enough stock to finish, then leave two square ends. The shape-cutting machine does the rest. It is the general practice to shape these rods out in the machine, leaving enough stock so that the milling machine can finish with one cut.

Some railroads cut certain dimensions on their driving rods to size, then sandblast or polish over the cut left by the machine. Whether or not this is good practice on a driving rod is doubtful. There is chance of a flaw or defect being left by the machine and not polished out. The writer believes that enough stock should be left on a locomotive main rod to finish on the milling machine.

As locomotive main rods usually have a high carbon content, it is important that preheating and normalizing be closely watched. The rods should be brought out of the preheating furnace at a temperature between 900 and 1,100 F. Set-ups and cuts should be speedily made so that no undue strains are put on the metal by cutting when too cold. After cutting has been finished, the rod should be put back in the normalizing furnace, the temperature raised to about 1,550 F., and allowed to stay at that temperature about one hour. It should stay in the furnace until thoroughly cool, which usually takes from 12 to 16 hr. There is a great saving in machine work when rods are shaped in this manner. Also the saving in wear and tear on machine tools is a big item.

Cut-steel crossheads have been

adopted as a standard on many roads, because it was found necessary to do something to stop the many engine failures by crossheads giving way. An accurate cost data record shows that a cut-steel crosshead can be finished complete at less cost. In addition, we undoubtedly have a better crosshead and one which will probably last the life of the locomotive.

In shape-cutting locomotive crossheads, there are a great many set-ups. Every cut must be accurately made so that just enough stock will be left to machine it properly. A careful operator is required because there is too much involved in the event that one of these billets is spoiled in shaping.

We find it advantageous to cut not less than eight crossheads at a time. When the machine is set up for a certain operation, time is saved by running the whole eight through that particular set-up. We find that an operator and helper will cut an average of four alligator-type crossheads complete in 8 hr. In cutting such heavy material, the heavy-duty cutting blowpipe is used, some of the cuts ranging as deep as 24 in. We generally use a No. 4 tip, with about 75 lb. per sq.in. oxygen pressure. The speed of the cut at that depth will run around 3 in. per min.

There is a great field for the shape-cutting machine in the manufacturing of locomotive valve-motion parts, such as eccentric crank arms, eccentric rods, combination levers, union links and other parts of the valve gear. These rods and levers can be cut out so accurately that about the only machine work necessary is finishing between the jaws and drilling and reaming out the holes for the pins and bushings. The time saving for the blacksmith and machine shops on this class of work is inestimable, and as before mentioned there is also a great saving on machine tools, especially the wear and tear on drills, reamers and milling cutters.

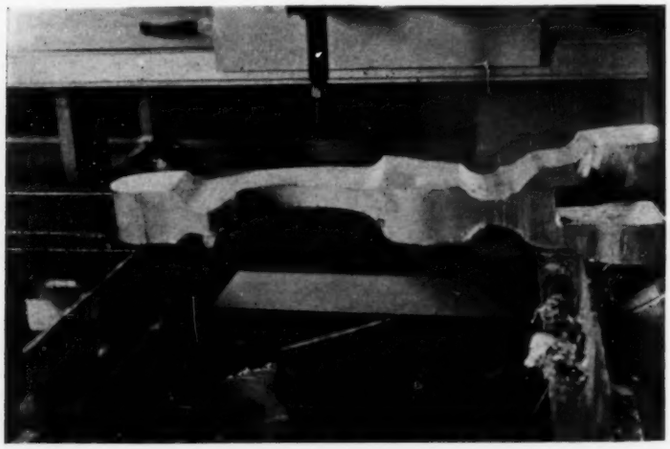
Locomotive drawbars and safety bars are manufactured through the shape-cutting machine at a great saving in labor costs. The forge shop simply forges the shanks with two square ends. The shaping machine profiles the forging to the proper blueprint shapes and cuts out the finished holes for the drawbar pins, which formerly was about a 5-hr. machine job. The drawbar is a finished job when it leaves the shape-cutting machine.

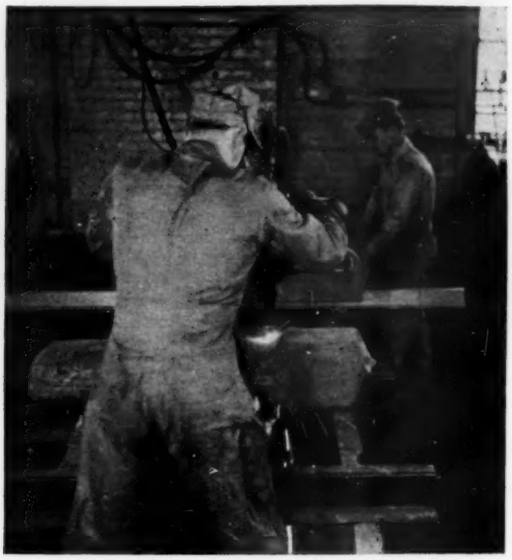
In car-rebuilding and construction work we have found the machine to be a great producer. When a number of plates of the same patterns are required for steel car construction, we make templets for the cutting machine, stack the plates in quantities and cut off a number at the same time. This insures all of the plates being uniform, and the machine leaves a nice finished edge that is not ragged. Much time is saved over the old method of shearing each individual plate with the consequent deviation in sizes. Coupler castings and coupler centering devices are also items that can be economically made on the shape-cutting machine.

We have also found that many items used by the Railway Department can be economically made on the shape-cutting machine. Guard-rail clamps and guard-rail spacer blocks can be neatly shaped out, and a great saving can be effected by cutting items of this kind out of such material as scrap locomotive and car axles.

The shape-cutting machine gives the forge shop a great opportunity to use up practically all the wastage cut from billets. Thus, little purchased iron or steel goes to the scrap pile. For example, hexagon nuts can be economically made from these pieces of billets. The blacksmith shop draws out the slab to the required thickness of the nut; the cutting machine does the rest. We cut out all our hex nuts as above described, on all sizes over 2½ in. Even the hole in the nut is cut out so that it can go right to the tapping machine. As an example, 4½-in. piston rod nuts that we at one time purchased finished at a cost of $5.00 each, are now made with the aid of the cutting machine for 98 cents each.

IN our locomotive and car shops we have developed some 250 items that can be successfully manufactured at a great saving on the shape-cutting machine. Among those not previously mentioned are spring rigging equalizers, spring hangers, valve yokes, bush-



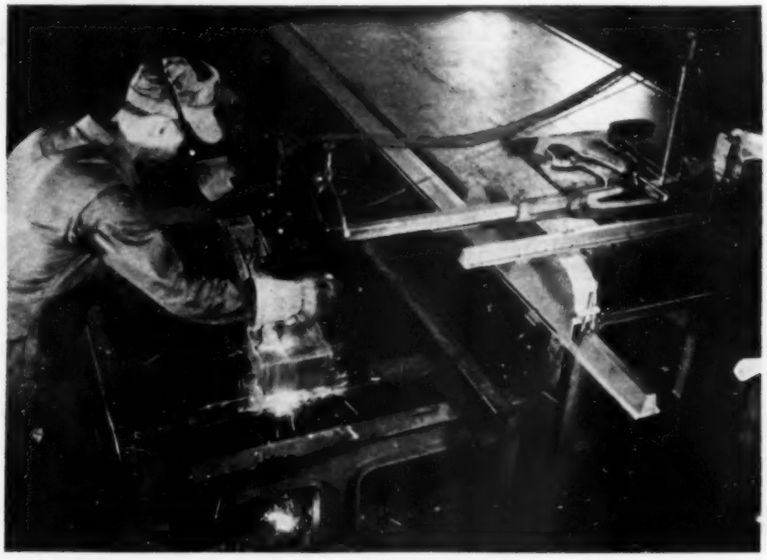


One of the most complicated jobs in a railroad shop is the Baker & Pilliod gear connecting rod. The work starts as a simple forging, and much metal is rapidly cut away to achieve the completed job

During one of the first trimming operations on the B & P rod, the operator must adjust the torch when passing from the 3-in. thickness to the 8-in. thickness

ings of all sizes, collars, driving-box liners, throttle lifters, main-rod straps, ratchet pawls, bull rings, gage brackets, knee braces, gear-connecting rods, engine-truck swing links, tube sheet rings, grate latches, wrenches, hooks, follower blocks, turnbuckles, brake-rod ends, wedges, stoker-elevator casings, frame sections, and many other necessary items that are used in locomotive and car work.

In conclusion, I would like to stress that when a shape-cutting-machine installation is made, whether it is in railroad shop, car shop or manufacturing plant, careful supervision should be exercised to see that operators carry out the instructions governing the uses of the machine. The designers of the machine and the gas manufacturers have issued well-defined rules as to speeds and feeds of the machine, oxygen and acetylene pressures in relation to the thickness of the material to be cut, as well as the correct sizes of cutting nozzles. Above all, watch temperatures in the preheating and normalizing furnaces, especially when shape-cutting material with a high carbon content, and when shaping any item that is to be used at high speed or subjected to severe strains. If all these precautions and instrucions are rigidly adhered to, the shape-cutting machine will be a success. If not, it will be a "flop".



Above—*Shaping the jaws of the B & P rod is a long job in the slotter but with the shape-cutting machine the operation is expedited.* Upper left—*The first cut is very irregular and this view indicates how well the tracing torch follows the direction of the tracing mechanism and templet*

Waste from large forgings is drawn down under the hammer and made into a variety of articles with the shape-cutting machine. Hex nuts cut from such salvage cost only 98 cents total as against $5.00 when bought finished outside

Stroboscopic Fingers

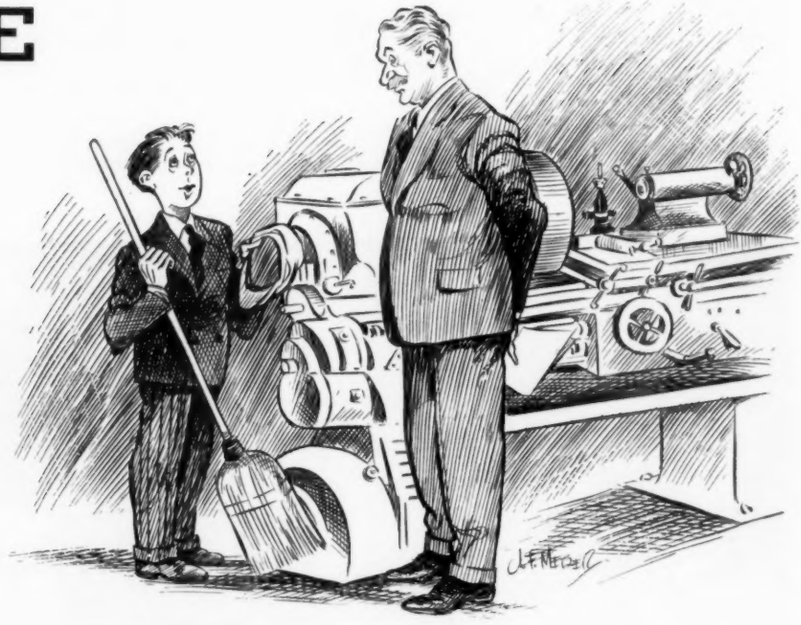
OCTAVE ANTONIO

After putting a cutter on the milling-machine arbor and starting the machine, did you ever wonder if you had put the cutter on the arbor right side to? You needn't stop the machine to make sure.

Here's how; spread the fingers of one hand and place the palm facing your nose. Now move your hand rapidly from side to side, looking between the fingers at the revolving cutter. The cutter will apparently slow up its motion so that the outlines of the teeth can be clearly distinguished. Of course, it's the old stroboscopic principle.

Two precautions are advisable. First, you had better explain to your fellow workmen what you are doing if you value their opinions, and second, don't get your thumb too close to your nose.

. . . ON LEARNING A TRADE



. . . "Mister, I'll sweep up your shop if you'll show me how to run a lathe"

CHARLES WESLOW

IN MY apprenticeship days, some of us boys attended Newark (N. J.) Evening Drawing School three nights a week, and at the end of the third winter, we graduated as "draftsmen." A good friend of mine shooed me back to that evening school the fourth winter for instruction in free-hand drawing, three nights a week, and the principal of the school shooed me right into the third-year class on account of my having graduated from the mechanical drawing class.

Other students of the free-hand class came to school equipped with a sandpaper block and just one charcoal stick. I came with a box of 25 sticks all sharp, which were kept that way for me by my sister at the rate of ten cents a week whether they needed sharpening or not. While the other students were wasting away their time sharpening their sticks, I always had a sharp one; thus my work got away ahead of theirs, and besides I studied at home the other evenings. They had already sunk two previous winters in that study, while I went through the whole works in one winter and graduated just the same as though I had attended all three winter terms.

SOME boys in this century attend a vocational school and at eighteen set out to learn the toolmaking trade in a regular toolroom. Thus, on account of the school training, they are able to "catch on" to the real art in a toolroom in much less time than if they had not acquired school training. Just like me, jumping from the drawing class right into the free-hand class. It was a cinch.

They don't get paid for going to vocational school to learn what they can about toolmaking, and neither did those young men, way back in the beginning of the century, get paid for hanging out in a repair garage just to learn all about automobiles.

Imagine a boy going into a machine shop with a broom in a town where they have no vocational school, and saying to the boss, "Mister, I'll sweep up your shop if you'll show me how to run a lathe." Yet young men in the era of changing from horses to horseless carriages, would go to a repair garage and offer their services in exchange for experience.

A lot of apprentices these days own a car, or are allowed the use of the family car, to go to work in. Soon as quitting time comes, they are off like a wild horse to some recreation center. Do you think they go home quickly in their car so as to have more time there to study *American Machinist's* Handbook? Not on your life—and there is more to be learned from that book than can be acquired in all their apprenticeship days, learning as they go along.

The main thing in a boy's life is to learn some art, whether it be a trade or profession, so that in his mature years he can make a better living than he would at unskilled labor. Those boys who take a chance on whatever they can get, hoping they may get advanced into a position where they don't have to work much, are like some of us old timers who take a chance on the Irish Sweepstakes, hoping hopelessly, that we will win in the end, but the "end" with us old fools is yet to come. If I had all the money I have spent so far on the Sweeps, I could buy my family of five a ticket to Heaven and back. And if the young boys had back all the time they spent at unskilled labor, they could use that time for training that would insure them good pay in their manhood.

Personal Quench

J. MURPHY
Sterling Company

Having need of a quenching tank recently and not wishing to spend much thereon, I shopped around and finally located a used bath tub from a wrecking yard.

It was a square end type—marred up somewhat but held water first rate. I had this sunk and cemented into the floor of the shop and it works out splendidly.

I expect to add another for oil quenching shortly.

WHAT IS the F.Q. of YOUR PRODUCT?

Are we again falling into the error of neglecting the fatigue factor in machine tool design? The author answers "yes" and suggests a yardstick that will measure effort, both physical and mental

P. F. BRYANT

WE HEAR plenty today about the I. Q. of certain individuals, and industrial executives are giving the line of thought it suggests some degree of semi-serious consideration. What machine tool builders would better be giving attention at the present moment is the fatique quotient of the product they are selling, or designing for sale, to the manufacturing industries.

Logically and necessarily, each successive improvement in the art of machine tool building has been followed by a reduction in the time required to turn off a unit of manufactured product. While the workings of this simple sequence of cause and effect has brought incalculable benefits to American industry, it was inevitable that, along with its blessings, it should have dragged in its train certain consequences that gave rise to new problems of both production and employment.

Back near the dawn of this century, when tungsten steel tools first began to come into general use, the mounting curve of product units turned off per machine-hour began to wear down the stamina of machine operators. Certain tools in every shop of any size were dubbed "man killers" by the shopmen, and giants in physique had to be hired to run those particular machines. Manufacturers in that industrial era found themselves confronted with a choice between limiting output to what could be produced by an employee personnel of near-Goliaths, or of replacing those muscle-taxing machines with a type that a normal man could operate for a full day and survive.

As you would expect, the machine tool builders came across; by providing power feeds to all the major moving parts and reducing the exertion required to do what was essentially left to be done by hand, they brought the then current equipment within the range of the average human effort. Industry again moved forward on an even keel.

Recently there was put on at Cleveland a mammoth exhibition of the latest products of the American tool builders art, shown in operation and turning out products. To an observer at that exhibition not blinded by a fascination for moving mechanisms, it must have been apparent that the engineers that are creating the tools of industry are once again faced with the problem of finding means of reducing the drain on the operator—both physical and mental—that the most recent developments in cutting-tool performance has obviously carried beyond the range of human endurance.

Thirty years ago, it was the introduction of tungsten steels that tripled spindle speeds and broke the backs of operators. Today it is tungsten carbide and the group of super high-speed cutting materials, which have followed in its train, that has jacked spindle speeds up to ranges undreamed of a decade ago and again brought to the fore the problem of operator fatigue.

Do not misunderstand this as from any angle a boost for so-called automatic machines. That term, and what it suggests to the lay mind, makes good material for the columnist and choice fodder for the social agitator, but the initiated know that without regard to to the Robotian characteristics any mechanism may display to the eye, there will be found not very far in the background a human intelligence or a whole group of intelligences that correspond in all respects to the visible operators of what are styled hand machines. Moreover, while some eight or ten years back it looked very much as if American industry en masse was going automatic, one of the most obvious lessons to be gleaned from the exhibition was that the recent step-up of production rates has had the effect of raising the quantity limit beyond which the hand-operated tool was conceded to be unprofitable, and has broadened its field. The cutting tool improvements and the changes they made possible, making it economical to run off lots of several hundred or even thousands of units from a simple set-up, have given the hand-operated tool a new lease on life and one that is certain to carry far into the industrial future.

Granting this, it becomes a matter of far greater significance that in the act of demonstrating to possible prospects at the Cleveland show the superproduction qualities of each manufacturers most improved products, the demonstrators in not a few instances were hopping about like jumping-jacks and putting on display an expenditure of effort that any prospective buyer would know, if he paused to give that phase of the matter thought, could not possibly be duplicated under normal labor conditions in his own plant.

The problem is as clear-cut and simple as two plus two. Thirty years back, production rates were tripled and all existing types of machine tools had eventually to be redesigned with the thought in the foreground of bringing operation at the faster rate within range of an average man's capacity for work. Recent new developments have made possible a further epochal step-up of unit production rates, but it seems that, in the stepping-up process, so much thought has been centered on the purely mechanical problems in-

volved, that most of the physical and all of the psychological effects of the change have been lost sight of.

Machine-tool sales are no longer influenced by the pattern of the scraper marks, the artistry of ogee curves or the luster of the finish. Granting that the buyer's judgment will rest on cold facts backed by figures and that he places orders confident that the production results forecast by those figures will be substantiated in plant performance. It becomes a matter of grave importance to the seller that he is not passing on to his customer certain qualities in his product—not covered by analysis—that will make the attainment of the assured production rates an impossibility under every-day conditions.

To play safe, every production analysis that is to be used later as a guaranty of performance should be paralleled with an effort analysis that will determine for a certainty whether it will be within the ability of the average run of operators to keep pace with that assured rate of output. For it is beyond the range of argument that if a machine-tool manufacturer is now building into his products certain characteristics of operation that will skim all the cream off a workman's vitality by 2:30 p.m., and send him home at the close of every working day dragging his lunch-box on the ground, he is handing on to his customers a fixed liability that will be eternally bobbing-up to his discredit.

Tool manufacturers owe it to industry to develop and apply a fatigue quotient test to each model of machine and type of equipment sold, a quotient that—like one's golf score—will spell dishonor if it mounts to high figures, but constitutes a mathematical assurance of customer satisfaction if it ranges low.

Unless this is done, the next five years will see the history of that earlier industrial period repeating itself, and machines that are near perfection in mechanical detail will be thrown out of plants because they turned out to be "man-killers" under conditions of normal usage.

THERE is another angle to this problem of fatigue that did not enter that earlier picture. The drain then was preponderantly physical, as it was only rarely that an operator met up with a production cycle so rapid and complex as to tax his mentality. Production rates today, to the contrary, demand speeds of manipulation that requires in addition to a husky physique, a mind that is alert.

Moreover, the present-day manufacturer thinks of his employees as putting their best thought and energies into perfecting the qualities of his own products. He fails to enthuse over types of machines that require a great deal of attention to mere details of operation because he has become very wise to the fact that, whatever proportion of an operator's capacity for work is worn away in the routine of production, leaves just that much less that can be applied to watching the materials being processed.

Tool builders seem to have been slow in grasping the significance of this change in the mental attitude of the tool user. One does not have to backtrack very far in the field of tool engineering to uncover evidences of a feeling that any machine that required the services of an operator might as well make him work for his wages. Within this writer's short memory, a suggestion that it might be foresighted design to group the things to be done in the course of a production cycle so the operator could either stand or sit at his work, was met with the sarcastic query, "Why not go one better and provide a bed for him to lie on?" Today's production tempo has pushed all such reactionary notions into the scrap pile, but the rate of acceleration has been—and is continuing to be—so fast, that accomplishments along the line of reducing operator wear-and-tear are lagging far behind.

HOW may you determine the F. Q. of your products? By a detailed and quantitative analysis along the same lines as the time-study analyses you have been using as a basis for production rates, but substituting for the machine performance factors, the things an operator must think of and the things he must do during one cycle of operation. Up to that point the procedure is simple; to transpose those simple factors into their equivalents in foot-pounds of human energy, and units of what might be established as a normal daily capacity for thought concentration, is plenty complex but no more difficult than scores of problems industry has licked once it was up against them so tight it could not wiggle out.

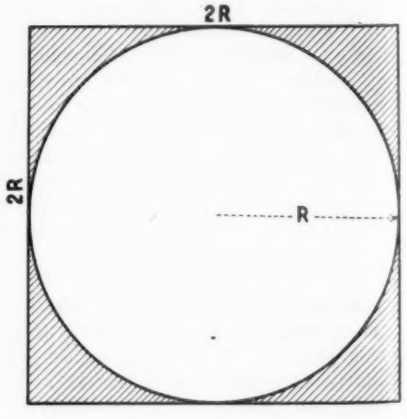
How can it be determined if the F. Q. of certain equipment is too high? If the manufacturer waits long enough, customer reactions will answer that question in no uncertain language, just as it did thirty-odd years ago when good machines stood idle because no operator could be found who would stick for more than one day. However, when the number of things to be done and thought of in a single cycle have been put down in black and white, and the total multiplied by the number of times that cycle will have to be duplicated to get a maximum day's production, it should be possible to apply standards of measurement based on human experience and common sense, and arrive at a fairly comprehensive result.

In the meantime, if you seek a short cut around all this implied red tape, visualize the operators of your present products as they worked at the Cleveland show or are wont to demonstrate to prospects in your own plant. Should the re-creation of this picture recall to your memory by auto-suggestion, an old-time vaudevillian juggling five balls with his hands while stepping a lively dance in rhythm with an orchestra, you can be certain that the F. Q. of your products is in the upper brackets, indicative of a need for mechanical surgery.

What Size Blank?—Correction

V. O. HERRICK
Instructor in Mechanical Drawing, Beverly (Mass.) Evening Trade School

In formula No. 2 of L. T. Sittig's article under the above title (*AM*—Vol. 79, page 851) there is an error in the formula for the blank. The shape is a rectangle with rounded corners and the area given is equal to $AB - 0.215R^2$, whereas it should be $AB - 0.8584R^2$. The accompanying illustration shows the shaded portion equivalent to the corners that have been rounded off. From this figure it will be seen that the area of the stated section is equal to $4R^2 - 3.1416R^2 = 0.8584R^2$. Thus, the area of the rectangle with sides A and B with the corners rounded off would be equal to $AB - 0.8584R^2$.



Editorials

AMERICAN MACHINIST ESTABLISHED 1877
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K. H. CONDIT • F. H. COLVIN
EDITORS

PAYING THE BILL

HEAVEN pity the poor Congressman who voted for the many extravagant federal gifts that have distinguished the spendthrift government that has been in power since 1933, for nobody else will do so. The taxpayer is becoming painfully conscious that he is going to pay the bill for this gorgeous spree, and he is looking at the men responsible with no very friendly eye. And there are many more taxpayers than there are war veterans, or cash crop farmers.

Only two courses are open—heavier taxes bearing directly on more voters, or fiat money. Each has its hazards for the legislator who wants to be reelected.

No wonder the first course causes cold shivers to run up and down the spine of a man who has to face the voters next fall. Nobody likes to be taxed, least of all when he is far from convinced that the money he has to pay will be well spent. The only hope for the candidate is that enough of the voters who do not pay income taxes will fail to realize that they are being taxed indirectly through the higher cost of the things they buy, and the larger rents they have to pay.

The second course—inflation—has its ardent supporters in Congress, but hardly anywhere else today. Not so many months ago inflation was being pushed as a desirable thing for the country, but the President and the country have learned a lot about it since then.

To issue paper money now to pay the soldiers' bonus and the farm subsidies would be the surest way to halt our encouraging progress toward recovery. Even the Washington authorities are beginning to see what has been evident to business since the beginning—that the government cannot solve the unemployment problem, only private industry can do that. Obviously, therefore, private industry must not be crippled by inflationary legislation.

WE taxpayers are going to have to pay this bill anyway. Let us pay it as cheaply as we can by standing pat for honest financial management rather than for fiscal jugglery. It will cost us infinitely more in the end if inflationists are allowed to postpone the evil day.

Berry Picking

TRUE TO his promise Major Berry has organized his council of industry and labor but it stretches credulity to the breaking point to accept his statement that industry is represented. Names of industrial leaders of prominence are conspicuous by their absence. One man whose name appears on a committee repudiates Berry completely and asserts that his name was used quite without authority.

Business men know that Berry picked his committees by hand and that they represent nothing but what he wants represented. Industry is as violently opposed to the whole Berry scheme as it has been from the beginning. But will Congressional committees realize the actual situation when they have before them legislative proposals sent up from the Berry groups? And if they do recognize the lack of industry backing will they act in the interests of the country, or solely to get votes? The vote record on the bonus is not very encouraging.

Industry's only hope is to prove that Roosevelt picked Berry and Berry picked his committees, and that what is recommended by the Berry-picked groups is certainly not likely to be what industry wants. The proof will have to be presented to Congressional committees, and to individual Congressmen by their own constituents.

Chips

WASHINGTON—Politics takes center of stage as candidates for presidency orate and New Deal defenders call Al Smith names . . . Federal Reserve Board appointments, non-political in nature, meet approval of Senate . . . Bonus rush starts as officials try to decide whether to continue veterans on WPA . . . American Legion commander says he will not start drive for pensions until authorized by Legion convention . . . House considers investigation of Townsend plan and similar projects . . . President calls in advisors to discuss tax plans . . . Labor leaders want to curb Supreme Court by constitutional amendment . . . Roosevelt sends special message to Congress recommending repeal of cotton, tobacco and potato control supplements to defunct AAA . . . Both Senate and House act promptly to kill them.

FOREIGN—Anti-Jewish sentiment, stimulated by smuggled Nazi literature, sweeps Poland . . . British naval delegates come around to U. S. belief in 35,000-ton battleships . . . Conference agrees to exchange data on building programs . . . Foreigners in Russia hard hit by regulation establishing exchange at five rubles to the dollar . . . Canadians consider legislation to free trade from restrictions . . . Britain seriously annoyed by Litvinoff's undiplomatic and slighting remarks about Edward VIII . . . Moves made by British to restrict production to more modern equipment . . . Assassination of German Nazi leader in Switzerland causes storm . . . Japanese report that Soviets are completing Siberian railroad links two years ahead of schedule.

FINANCE—U. S. Steel reports first operating profit in four years, Bethlehem earns four millions . . . Railroads report 25 per cent gain in net in December . . . Increased traffic expected to force purchase of new locomotives by several roads, P.R.R. in particular . . . Federal Reserve urges banks to increase industrial loans . . . New York banks ship 15 millions in gold to Europe . . . Chrysler reports best year in its history, raises dividend to one dollar quarterly.

INDUSTRY—United Engineering & Foundry buys McIntosh-Hemphill Company . . . General Motors, Bendix, and Chrysler obtain injunctions stopping Labor Board from conducting hearings on complaints . . . United Mine Workers vote to withdraw from A. F. of L. . . . Five trade associations ask Supreme Court to interpret anti-trust laws to permit joint action to eliminate bad trade practices . . . Cotton textile plants forming voluntary NRA to head off restrictive legislation . . . Unions believe they have new and effective weapon as demonstrated in sit-down strike of rubber workers . . . United Mine Workers refuse to listen to Green when he urges abandonment of industry unions . . . Vote to double salaries of Lewis and other high officials despite protests of many delegates . . . Eastern railroad executives meet with railroad labor leaders to discuss ways to protect men forced out by improvements . . . Acute labor shortage worries airplane manufacturers on West Coast who have large orders . . . General strike in Pekin, Ill., brings out troops . . . Steel industry to spend $200,000,000 in 1936 for modernization . . . New York teamsters' union indicted by grand jury for racketeering.

TRADE—Plan for free port in Staten Island section of New York is approved . . . Shipping moves again on Pacific Coast as marine strike ends.

INDICATORS—Steel production improves slightly in spite of lag in automobile production forced by bad weather . . . Electrical energy output climbs counter-seasonally approaching record peak . . . *Business Week's* index recedes to 72.3.

Watching Washington

Taxes or greenbacks? . . . Berry convenes his handpicked committees . . . AAA supplements repealed . . . Neutrality takes a back seat . . . State unemployment laws approved

WASHINGTON—Faced with the question of where to find the money for its open-handed largess to the veterans and the farmers, not to mention other beneficiary groups, Congress is torn between the necessity of selecting the least painful form of taxes and the authorization of paper money printing. The President knows that the issuance of fiat money would almost certainly cost his party the election, which has shifted from a 3-to-1 to an even money bet since Al Smith did his stuff. He is therefore pressing for tax legislation.

New Excise Taxes?

There seems to be general agreement that $700,000,000 will be enough to tide the government over until after election, at which time the budget balancing question will have to be faced squarely. The inflation bloc has not given up hope but its chances are remote. The real head scratching is over what form of taxes to impose. The probability is that the new taxes will be of the excise variety. Advocates point out that most of the processing taxes were not widely resented, and that if a general manufacturers sales tax can be slipped over without stirring up too much resentment it is the ideal way to get the money. If this program is followed care will have to be taken to avoid such evils of the processing taxes as 5c. a lb. on bacon and 6c. a lb. on ham. It will also be necessary to make sure that taxes on some products but not on possible substitutes will not wreck certain industries. The base of these excise taxes will naturally have to be considerably wider than that of the processing taxes in order to cover the bonus costs.

Although it may seem a bit like rubbing it in on distraught Congressmen the Treasury experts have been working out alternative tax schemes including a 4% manufacturers sales tax and an income tax that would boost the normal rate from 4 to 8% and cut married person's exemption from $2,500 to $1,500 and those of single persons from $1,500 to $750. Nothing is likely to come of the latter proposal because of the painful memory of what happened when Senator La Follette proposed practically the same thing last year. That proposal went out quickly then and it will go out more quickly now, because it would be a confession that Al Smith was right in his contention that those with incomes under $5,000 would pay the bill for the heavy spending.

Another group is for avoiding excise taxes and putting the burden on corporation profits on the theory that the stockholders who would be hit are against the New Deal anyway and that excise taxes would alienate an entirely different group. Meanwhile, although the excise tax is the most likely to win, every passing day puts the government deeper in the hole. It is almost inconceivable that Congress would pass a retroactive excise tax, because it might be unconstitutional and certainly would be immoral.

Major Berry called his handpicked committees together on Monday to see what they could do. Strange to say some of the so-called industry members on these committees seem to have overlooked completely the fact that any recommendation they send up will be released by Major Berry.

Reserve Board Approved

Comment on the personnel of the new Federal Reserve Board is to the effect that although no outstanding names appear in the list it is much better than had been feared. Those who remember the early days of the original board point out that the first appointees had to grow into their jobs just as the new men will have to do, and that they developed with gratifying rapidity.

A lot of litigation was dispensed with and several lawyers lost some prospective fat fees when the President recommended repeal of the three supplementary AAA acts governing cotton, tobacco and potato production. Congress acted on the recommendation at once thereby beating the Supreme Court to it because unquestionably these acts would have followed the NRA and AAA into the discard as soon as the Court got around to them.

The drastic neutrality legislation which would have made havoc of much of our foreign trade, and placed us in an extremely dangerous position in case of war where we were a combatant, has been slowed down by the logical and vigorous attacks on it, and the outcome will probably be an extension of the existing temporary act.

Farm Bloc More Cautious

Substitute AAA legislation is also moving more slowly than had been expected as members of Congress ponder the advisability of passing another law likely to be declared unconstitutional. Perhaps agricultural constituents are well aware that another disappointment in the way of farm legislation is almost sure to be fatal to their chances.

The Social Security Board has approved unemployment compensation laws of New York and Washington, thus bringing the total of states with approved laws to seven. These seven states and the District of Columbia have 29 per cent of the pay-roll of the country subject to federal tax. Proposed sample state laws have been worked out by the experts of the board but nothing has as yet been done with them.

S.A.E. Production Men Advance Meeting Date

The National Production Meeting of the Society of Automotive Engineers will be held April 21 to 24 at Detroit. Carl L. Herrmann, vice-president and general manager, Bantam Ball Bearing Co., South Bend, Ind., is the newly-elected vice-president of the Society in charge of production activity.

Because of the press of work in connection with the Fall automobile show, the production meeting will be held in the Spring this year.

Production meetings of the Society began in 1922, but it was not until 1925 that this work was made a division of the Society's activity.

Mason Britton and Fred S. Weatherby 35 Years With American Machinist

Kaiden & Keystone Photo

MASON BRITTON, senior vice-president of McGraw-Hill Publishing Co., began his publishing career as stenographer and make-up boy on *American Machinist* 35 years ago.

FRED S. WEATHERBY, veteran advertising executive, who joined *American Machinist* 35 years ago, and is now New England Manager of McGraw-Hill Publishing Co.

Royal Atelier Photo

Thirty-five years ago, on Feb. 11, a young stenographer from Petersburg, Va., hung up his hat for the first time in the modest offices of the Hill Publishing Co., in New York City. He had done well in the office of the chief clerk of the Atlantic Coast Line R.R., but ambition had driven him north to the center of the business world of the United States. Despite his determination to show the Yankees what a good stenographer could do, he was not accustomed to northern winter weather and his little cubicle was so cold that his numb fingers could make little speed at first. He had a hard time that first winter.

Today Mason Britton is the senior vice-president of the McGraw-Hill Publishing Co., successor to the old Hill and McGraw publishing companies. *American Machinist*, on which he was first make-up boy and eventually manager, is one of the five McGraw-Hill magazines under his immediate direction. In addition he carries the responsibility of overseeing the circulation activities of all of the McGraw-Hill journals.

Before McGraw-Hill disposed of its printing plant he was in charge of that, too. He was also president of the Business Publishers International Corp., publishers of export magazines, and affiliated with McGraw-Hill and the Chilton Co., and is now chairman of its board.

After the World War Mr. Britton was chairman of the Surplus Property Committee of the Associated Business Papers, which did a splendid job in helping the government to dispose of its surplus war material without disrupting the various markets concerned. He has been a director of the Audit Bureau of Circulation from its beginning, and is also a director of the American Manufacturers' Export Association. He has recently been elected a director of the Advertising Federation of America.

Just six weeks before Mr. Britton came to New York to join John A. Hill, Fred S. Weatherby was hired as western manager of *American Machinist*, in charge of all territory from Pittsburgh west. He had previously represented The St. Louis Lumberman and The Age of Steel, published by The Journal of Commerce Co., St. Louis. Before that he had been advertising manager of J. A. Fay & Egan Co. of Cincinnati.

After a year in the western territory Mr. Weatherby was transferred to New England to represent *American Machinist* there. In 1929 the McGraw-Hill Co. opened a Boston office in the Statler Building and Mr. Weatherby was appointed New England Manager of the company. Today he manages to carry on his executive duties and at the same time to represent *American Machinist* and "Product Engineering" in the New England and eastern New York state territory.

Export Men Will Meet March 17 in New York

The 1936 Get-Together of export executives will be held on March 17 at the Hotel Pennsylvania, New York, N. Y., under the auspices of the Export Managers Club of New York. From 500 to 600 export men are expected to attend.

World trade economics and potential markets overseas will be discussed at the morning session. Building foreign distribution and export sales effort will be discussed at the afternoon session, and F. D. Bowman, advertising manager of the Carborundum Co., Niagara Falls, N. Y., will deliver the address at the banquet in the evening. Four group luncheons will be held.

Western Massachusetts Industrial Exposition

The Purchasing Agents' Association of Western Massachusetts, Inc., will hold an industrial exposition in the municipal auditorium, Springfield, Mass., March 5-7. More than 20,000 are expected to attend, according to J. E. Connor, National Equipment Co., Springfield, association president.

Motors AND OTHER MATTERS

Used-car stocks can be worked off . . . Car plants prepare for spring bedlam . . . Chevrolet pointing for '37 . . . Big Three to buy equipment . . . Toledo labor situation better as politics change

BURNHAM FINNEY
Western Editor

DETROIT — Zero temperatures the past two weeks have not warmed the hearts of automotive executives, who realize only too well that icy streets and snow-blocked roads don't help to sell motor cars. The industry knew that this spell of bad weather and bad business was inevitable, yet its coming was something of a shock to those who have spent most of their time the past year in trying to squeeze out more production rather than in figuring out ways to keep idle factories from going to pot.

Used cars continue to be the industry's chief bugaboo. Some companies contend that the used-car situation has been grossly exaggerated. Packard reports that "used cars are presenting no problem to us in connection with the sale of new cars now and will not in the heavy buying spring season. They are moving out in satisfactory volume and at good prices."

Six-Weeks Supply

In the main, however, dealers have on hand around 550,000 used cars, which represents about a six-weeks' supply. This is close to the all-time peak attained early in 1930. Car manufacturers are predicting privately that stocks will rise until early in March, when they will touch or perhaps mount higher than the 1930 level. They then will stay at a pretty dizzy height until May, when the inventory curve will start to descend.

There is a silver lining to the used car cloud. There are about seven used cars sold for every four new cars. If one figures conservatively, over 5,000,000 used cars should be sold during 1936. With present stocks, dealers should turn over their used car inventories around 10 times a year, whereas 12 or 13 is normal. That shows that stocks of 550,000 units aren't so cumbersome that officials should get nervous prostration worrying about them. Moreover, when the all-time peak was hit in 1930 the country was economically on the toboggan. Today the condition is reversed.

While factories are operating three or four days a week on curtailed schedules, their executives are preparing for a spring rush which will turn plants again into a bedlam of excitement for 90 days, probably beginning sometime in March. There isn't likely to be any 500,000-car month, as there was in April of 1935, but production should easily top 400,000 units a month during April and May. Last year the industry derived much sales strength from farming districts. Sales executives returning from tours of agricultural states report that farm purchasing power this year should be as great as last year and perhaps greater.

The industry doesn't look for a spectacular gain this year comparable with the almost phenomenal improvement of 1935 over 1934. Last year it was the beneficiary of two new model introductions which abnormally boosted sales. This year the only model announcements will be at the tail-end of the year, so car manufacturers will feel well satisfied with a modest increase.

1937 Tool Programs

Nineteen thirty-seven still shapes up without signs of a dash by car manufacturers toward radical designs. Buick is expected to be the first company out with a tool and die program for next year. In fact, it already is reported to have placed orders for fender dies with a Toledo company. Buick has a good line of cars this year and relatively is holding up better than some other General Motors car divisions during the present quiet period. It made money in 1935 for the first time in several years, according to reliable reports. The management is content to let well enough alone and for next year only minor changes are said to be contemplated, mainly centering around a redesign of front fenders to give them a greater flare.

A manufacturer in the higher-price group, which the past year invaded the medium-price field with a new line, is expected to act in the next 30 days on a tooling program for a six in a still lower price bracket. This car won't be ready until the 1937 season gets under way. It is possible that there will be a considerable interchange of parts between the new car and the one introduced last year, thus effecting production economies.

Chevrolet is reported to have a number of major changes in mind. In addition to a newly-designed cast-iron piston, which will be made at its Saginaw foundry, it is understood to be planning on a four-bearing instead of a three-bearing crankshaft and is considering adoption of a new transmission, for which its new Saginaw plant has put out inquiries. It will retain a six-cylinder motor, despite the recurring stories that it intends to shift to an eight.

Early Trial Runs

Still smarting from its production delays in 1934 and 1935, Chevrolet is reported planning to "beat the gun" in 1937. It wants to have all of its equipment for next year's production installed by the end of July. What is more, it hopes to have one motor line tooled by June 1 and to run through 1,000 engines and store them for later use, this operation enabling the production department to get out all the "bugs." Chevrolet is said to be contemplating purchase of a substantial amount of equipment for Flint for cost-saving purposes.

Chrysler should buy much machinery this year for its various plants. Plymouth's machining capacity, at peak times, is hardly sufficient to care for its assembly requirements if production and sales continue to grow. It would not be surprising, therefore, if additional equipment is bought this year and the machining division enlarged.

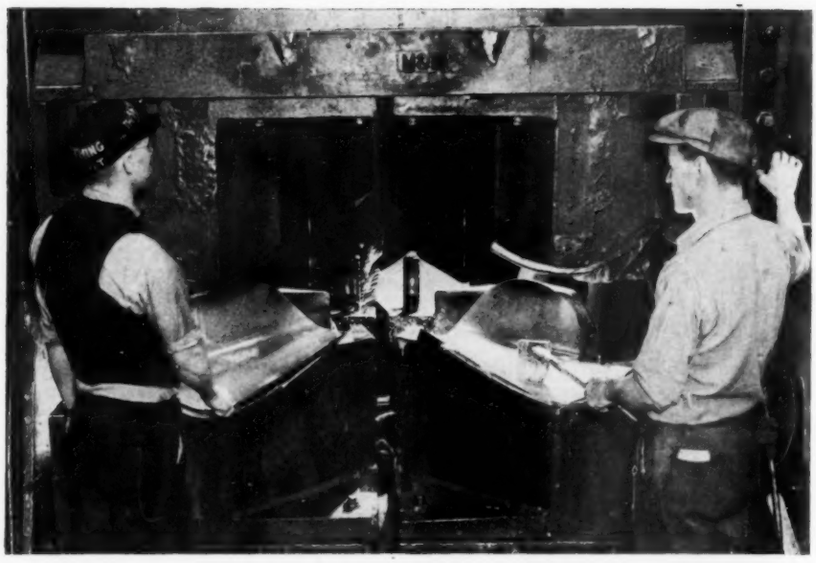
Ford is maintaining a schedule of 5,200 cars a day through February. It is not known whether the "stop" order on machine-tool purchases has any special significance. Such orders in the past usually have been forerunners of engineering changes, but there is little to support such a conclusion at present. It is understood that a batch of

small V-eight motors for England and France have recently been made at Rouge. These motors, incidentally, have cast steel pistons made of the same material as the Lincoln-Zephyr pistons, a development of the Ford metallurgical department.

Equipment valued at several million dollars will be placed in the next 60 days by the Big Three, unless present plans are discarded. There is slight indication of major tooling programs by independent companies. Local tool and die shops believe that orders for 1937 work will begin flowing in this month. They are elated at the report that Fisher Body intends to let out a considerable part of a big tooling program instead of trying to do all the work in its own shops, the object apparently being to take no chances on not getting the job completed on time.

* * *

Following a wave of strikes which gave the city plenty of unwanted publicity, Toledo citizens have been busy setting their house in order. The first accomplishment was to elect a city manager, John N. Edy, formerly assistant director of the bureau of the budget at Washington. Replacing a Socialist mayor, Mr. Edy already has effected notable municipal economies in finances and management. Encouragement no longer is given to a radical element which kept the labor pot boiling for months.



Busily Working on the '36 Model—**The principal operation in making Pontiac radiator shells is drawing, and here both sides are done on one press. Retooling of the plant for 1936 production entailed $370,000 of expense in the sheet-metal plant**

A Toledo Industrial Progress Exposition has just been held. It was attended by over 75,000 people. The net profit from the exposition is to be used by the Toledo Chamber of Commerce to advertise the city. Seventy-three lake vessels are wintering in Toledo harbor, providing more ship repair work than in the last five years. Toledo's business volume for January averaged 21 per cent ahead of the same month last year.

Auto-Lite's Labor Pact

Electric Auto-Lite Co., one of Toledo's biggest industries, paid out more than $12,382,000 in hourly wages last year, according to president Royce G. Martin. The company has concluded a new wage and working agreement with employees which calls for a nine-hour day during the peak production season, limited to about two months.

Doehler Die Casting Co. is busy on radiator grilles for automobiles, while City Auto Stamping has large automotive contracts. Owens-Illinois Glass Co. is going heavily into the can-making industry. It has acquired the Tin Decorating Co., Baltimore, and the Enterprise Can Co., McKees Rocks, Pa., and is said to be negotiating for two or three other companies. All will be operated as the Owens-Illinois Can Co., with headquarters in Toledo. Owens-Illinois also is entering the glass building block field and is producing fibrous glass for use as insulation, as air filters and as thread.

Plaskon Co., Inc., is having a good run of business, making and selling urea

Exports of Machinery During December, 1935

	December 1935	November 1935	December 1934
Electrical machinery and apparatus	$6,046,744	$7,475,827	$5,865,864
Power generating machinery (except automotive and electric)	716,418	655,668	589,671
Construction and conveying machinery	538,975	763,778	467,978
Mining, well and pumping machinery	2,723,948	2,464,969	2,404,071
Power-driven, metal working machinery	3,444,611	3,923,375	1,656,697
Other metal working machinery	318,954	348,243	179,057
Textile machinery	859,821	915,667	759,318

Exports of Metal-Working Machinery During December, 1935

	December 1935	November 1935	December 1934
Engine lathes	$144,188	$128,727	$41,732
Turret lathes	114,085	107,523	39,700
Other lathes	92,389	104,224	25,469
Vertical boring mills and chucking machines	246,166	130,647	91,171
Tread-cutting and automatic screw machines	222,360	268,834	51,379
Knee and column type milling machines	84,412	90,736	53,413
Other milling machines	321,819	358,428	102,485
Gear-cutting machines	161,203	175,200	74,528
Vertical drilling machines	20,144	220,119	5,542
Radial drilling machines	13,119	11,413	12,467
Other drilling machines	280,648	226,446	89,581
Planers and shapers	104,646	71,227	28,672
Surface grinding machines	214,109	194,404	17,156
External cylindrical grinding machines	147,069	80,061	65,067
Internal grinding machines	100,986	198,086	95,245
Tool grinding, cutter grinding, and universal grinding machines	112,033	250,699	42,246
Other metal grinding machines	81,795	59,088	38,338
Sheet and plate metal-working machines	160,094	193,127	111,511
Forging machinery	168,507	113,787	135,147
Rolling mill machinery	152,941	246,270	239,884
Foundry and molding equipment	167,751	328,883	30,830
Other power-driven metal-working machinery and parts	334,147	365,456	265,134
Other Metal-Working Machinery			
Pneumatic portable tools	54,793	67,385	50,407
Other portable and hand or foot operated metal-working machines and parts	51,851	81,349	53,017
Chucks for machine tools	13,073	25,415	10,149
Machine-operated pipe and thread cutters, stocks, dies, taps, and other machine-operated cutting tools	153,869	123,016	46,005
Other metal-working machine tools	45,368	51,078	19,479

formaldehyde plastic material. Libbey-Owens-Ford Glass Co. is doubling its investment in a window glass plant at Futashima, Japan, the Japanese company now building a new plate glass factory at Yokkochi. Chevrolet Motor Co., although it pulled out part of its transmission manufacture from its Toledo plant, has installed equipment for making forgings there.

Machinery Not Made In Canada to Pay 20%

Machinery of iron and steel not manufactured in Canada has been set up as a new item in the trade agreement with the Dominion, and calls for a 20 per cent duty, according to Lewis M. Lind, acting chief, Machinery Division, U. S. Bureau of Foreign & Domestic Commerce. The tariff applies to a large percentage of machinery sold by United States manufacturers to Canadian users.

When the "not made in Canada" question is involved, the 25 per cent general tariff must be paid, but the importer or purchaser should make prompt claim through the U. S. Commercial Attache for the 20 per cent rate. This method would reduce correspondence and speed up decisions.

Under the trade agreement, which became effective Jan. 1, machinery of iron and steel, unless otherwise provided for, was reduced from 35 to 25 per cent, ad valorem. (*AM*—Vol. 79, p. 860d.)

A.S.T.M. Announces Symposium on Metals

A symposium on high-strength metals and a week of committee work in fields of interest to the metal-working industry will take place at the Hotel William Penn, Pittsburgh, March 2-6 under the auspices of the American Society for Testing Materials. Many subgroups of 20 main committees will convene, and it is expected that nearly 100 meetings will be held to review research programs, existing standard specifications and tests, and new specifications under development.

The technical feature of the Society's regional meeting will be the symposium on March 6 on "High-Strength Constructional Metals." Among the authors who will present papers at this session are C. H. Davis, metallurgist, the American Brass Co.; E. H. Dix, Jr., chief metallurgist, Alluminum Co. of America; F. M. Geiger, International Nickel Co.; E. F. Cone, editor, Metals & Alloys; E. E. Thum, editor, Metal Progress. Inspection of some of the outstanding testing and research laboratories in the Pittsburgh area have been planned.

Engineers in charge of the arrangements and program for the Pittsburgh Regional Meeting are Jerome Strauss, vice-president, Vanadium Corp. of America, chairman of the program committee; F. H. Frankland, technical director, American Institute of Steel Construction; R. A. Wilkins, vice-president, Revere Copper & Brass, Inc., and Mr. Dix.

Power Engineers Plan Midwest Meet in April

A program calculated to present the newest and most interesting developments in the power industry is being planned for the Midwest Power Engineering Conference and the Midwest Engineering and Power Exposition, April 20-24, Chicago, Ill. Morning technical sessions will be held in the Palmer House, and afternoon sessions and the exposition will be in the International Amphitheatre.

Power economics, coal, refrigeration and power transmission are some of the topics which will be discussed, according to an announcement by G. E. Pfisterer, manager of the exposition.

Mill Supplies Sales Gain During November

The *Mill Supplies* indicator of U. S. sales of plant operating and maintenance supplies rose 3.9 points in November to 84.9, as compared with 81 in October. All territories except the Pacific coast took part in the increase. Government purchases rose from 6.9 per cent of the total in October to 8.3 per cent of the total in November. The average monthly sales for the 1923–1925 period is taken as 100 on the indicator.

Industrial Review

• SEVERAL DISTRIBUTORS of machinery and machine tools report that the first week in February was not quite up to the rather satisfactory January level, but on the whole there seems to be no reason to believe that February business will not be good. The unusually severe winter weather which has slowed down train schedules and blocked highways has undoubtedly had its effect in delaying some business that otherwise would have been placed. The increase in lathe prices was postponed from February 10 for five days.

• DESPITE THE weather considerable business was placed in the New England territory and the volume of inquiries promises active business for some time to come. Generally speaking the same is true of New York City and the Metropolitan area. New York distributors report a very good volume of orders during the first week of February. In Pittsburgh the opinion is that February started off at a somewhat slower pace than January, a good month.

• INDUSTRIAL EMPLOYMENT in Cleveland is at the highest level since May, 1930 with the common labor rate at 45½c. an hour. There are no important strikes and none are anticipated in the near future. Dealers report a perceptible slow-up during the first few days of February after an exceptionally good January. In Detroit the slowing down in automobile production has had its natural effect on machinery, small tool and supply orders which have been relatively quieter for some weeks. Inquiries for equipment continue to be good, however, and releases are expected shortly. In Cincinnati January business was better than had been expected and although there has been some slackening in the first part of February the shops continue to operate at a high rate. There are no labor disturbances.

• ST. LOUIS REPORTS one of the worst winters on record and some drop in business lately as a consequence. Around Chicago the machine tool business continues good, measured both by inquiries and by actual orders. Everything is quiet in the Milwaukee district so far as the labor situation is concerned. The automobile industry is inquiring actively for prices on special jobs but orders are reported to be rather infrequent. The placing of large orders with the West Coast airplane and engine plants has created an acute skilled labor shortage. Settlement of the marine strike has cleared the air.

Two New Indexes

Trends of Machinery and Shop Supply Sales

In the machinery field the sales index of machine tools has been a standby for nearly a score of years. Sales of foundry equipment and woodworking machinery have also been reported for a considerable time, as have sales of commercial stokers and pumps. More recently statistics on electric motors and industrial air conditioning equipment have been collected, partly as an outcome of NRA activities.

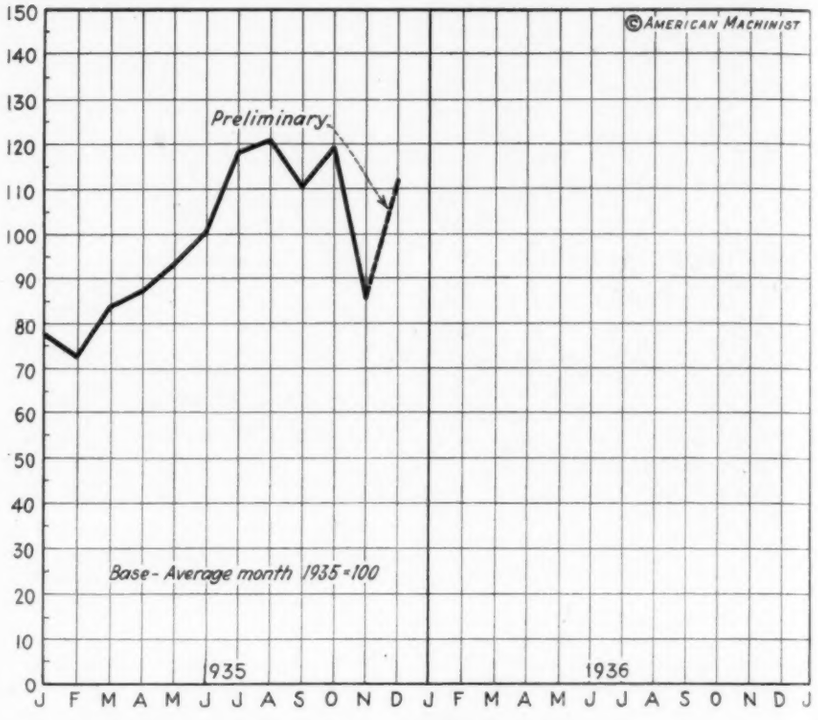
No strictly industrial machinery index has ever been constructed, so far as we know, and since there is a genuine demand for such an indicator one has been made up from the seven sets of statistics already mentioned. The first draft of it appears at the right.

In constructing this index, which is weighted in accordance with sales volume of each of the constituent factors, it was decided to use the average monthly sales of 1935 as a base. One reason for this decision was the fact that figures for some of the products do not go back more than two or three years. Another was the discovery that the average sales volumes of machine tools in the years 1925, 1930 and 1935 were so nearly constant that it seemed fair to take the 1935 average as a normal figure. The machine tool factor is the most heavily weighted one of the seven.

This *American Machinist* Industrial Machinery Index will be published monthly, and it is the intention to plot on the same chart various accepted indexes of business activity, a different one each time.

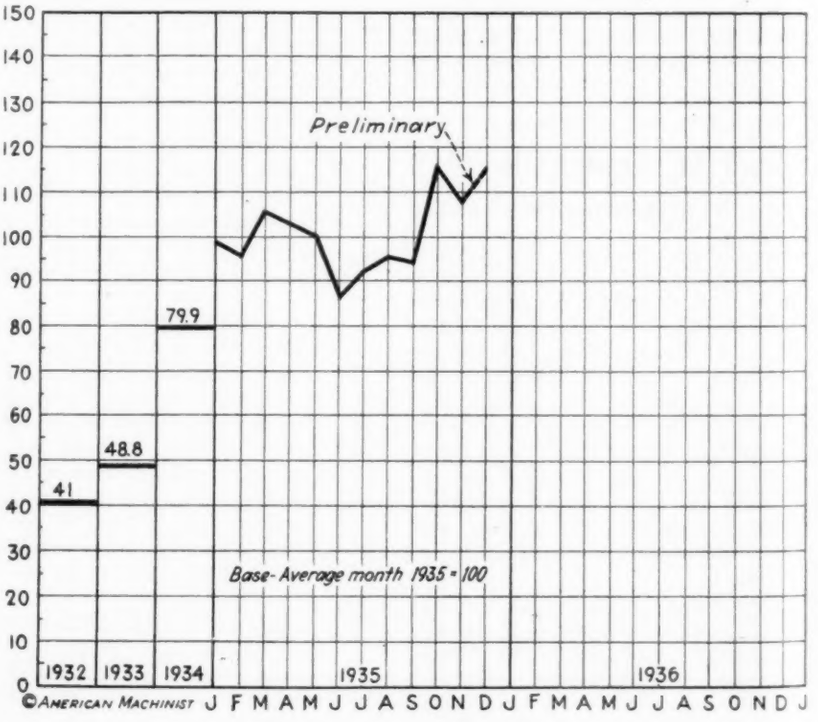
The second index illustrated, the *American Machinist* Index of Shop Supply sales, was developed by W. E. Kennedy, manager of *American Machinist*, for the information of the contributing trade associations. These are the Die Head Chaser group of the National Machine Tool Builders' Association, the File Manufacturers Association of the United States, the Grinding Wheel Manufacturers Association, and the Hack Saw Manufacturers Association of America, Inc. The Supply Index has been so useful to those who have had the privilege of seeing it regularly that we have prevailed on the four associations to permit its use in *American Machinist*.

Like the Industrial Machinery Index this one is weighted to correspond with the relative sales importance of the constituent factors. It has been transferred to the 1935 monthly average base so that it will correspond with the other index.



Sales of Industrial Machinery

Preliminary figure based on six of the seven factors showed sharp upturn in December



Sales of Shop Supplies

With one of the four factors missing the December figure recovered to the October peak

Dean Kimball and Herman H. Lind Speak to Youth on NBC Network

The machine-tool and metal-working industries offer excellent opportunities to young men of today, it was disclosed on Feb. 3 when Dean Dexter Kimball, college of engineering, Cornell University, and Herman H. Lind, general manager of the National Machine Tool Builders Association, were guest speakers on the Greater New York Forum on Character Building, a National Broadcasting Co. network program. Joseph McKee, one-time acting-mayor of New York and director of the forum, introduced the speakers.

As long as people want more conveniences, more luxuries and have the urge to better their standards of living, there will always be a demand for machine tools, improved manufacturing processes and inventions, both speakers agreed.

But the machine tool, often cited for making mere automatons out of workmen, requires men of higher skill and more and more understanding than simpler equipment did, and a young man who is willing to learn the business from the bottom up, and to continue his study of related sciences will find real opportunities if they are mechanically inclined, Mr. Lind said.

"The fact that the call today is for skilled men proves this point. The older skilled men are now, and always will be, in demand for jobs requiring thought, planning and that indefinable something which transcends doing a job merely well enough to get by. Training and experience are necessary to understand the capacity and limitations of machinery and metal," he said.

It is impossible, Dean Kimball said, for science and technology to "take a holiday," as has been suggested from time to time as a panacea for economic ills.

"The initial, somewhat harmful, effects of technological advance are offset in the long run by the creation of new enterprises," he said, and pointed to the telephone, automobile, typewriter, the radio and the fields of electrical engineering as having created as much, or more, employment than these developments had destroyed.

A statement by the late Col. Malcolm C. Rorty, written just before he died last month, was read by Mr. McKee. It said, in part:

"No useful art of invention has ever been lost to human knowledge. Political systems may fall in ruin. Whole peoples may decay and be supplemented by more vigorous populations. But their achievements in science and mechanics will live after they are gone.

"Not once in all the thousands of years of which the tale is unfolded by the patient excavation of buried civilizations, has a race learned how to smelt iron from ore, and then lost that art.

"So, whether we like our mechanical civilization or dislike it, we have no choice. We are caught in the remorseless grip of scientific and mechanical progress, and we must travel the road that it leads. Fortunately, this road is not wholly a hard one. At least it is interesting.

"There are those who will say that the 'good times' are over; that there is not enough work to go around. But don't believe them.

"We have had depressions from time to time during the past 100 years, and each time we came out of one there was a full-time job for every competent worker."

BUSINESS ITEMS

United Aircraft Corp., Hartford, Conn., plans a new stock issue of approximately $5,000,000, which will be considered by stockholders at a special meeting March 6. Unfilled orders of the Pratt & Whitney Aircraft Co., the Hamilton Propellor Division and other United Aircraft subsidiaries has jumped from $4,713,210 valuation Sept. 1, 1934, to a $15,800,000 valuation Dec. 31, 1935. Proceeds will be used for plant additions for engine and propeller manufacture at East Hartford and for plant expansion at the Sikorsky unit in Stratford. New machine tools and high-speed production units will be purchased for propeller manufacturing.

Link-Belt Co. has moved its St. Louis district sales office from 3638 Olive St. to 1018-21 Louderman Bldg., 317 North 11th St. Howard L. Purdon is district sales manager.

Approximately $500,000 will be used by Carrier Corp., Newark, N. J., for improvements in production facilities. The company recently realized this amount by selling its stock interest in Carrier Engineering Co., Ltd., of London, in line with its policy of not holding stock in its foreign affiliates. Exchange of patents with the British company, and supplying it with manufactured equipment will continue.

Canton Foundry & Machine Co., has moved its general office from Canton, Ohio, to 6400 Breakwater Ave., Cleveland, Ohio, J. R. Bucher, president, announced.

Platinum Products Corp., New York, has leased property of the Erskine Danforth Co., Stamford, Conn., and will manufacture cigarette lighters, pencils and novelties.

OBITUARIES

Clive Belden Vincent, 72, chairman of the board of directors of the Torrington (Conn.) Co., died Feb. 4. Mr. Vincent began with the Excelsior Needle Co., which was taken over by the Torrington Co. Subsequently he became director, secretary and treasurer of the company. He was secretary-treasurer until 1930 and had been chairman since 1925. Mr. Vincent was a director of the Dayton Mfg. Co., Torrington.

Henry Hunerkopf, 53, superintendent of tool and machine design, General Electric Co., Bridgeport, Conn., died Jan. 30. He began with the Sprague Electric Co., New York, 30 years ago, and joined the General Electric Co. 13 years ago, when that company purchased the Sprague Electric Co. He was an expert in machine design.

Don Allen Curtis, who had held major executive posts for the Lucas Machine Co., and Curtis Machine Co., Jamestown, N. Y., died in that city on January 25.

Frederick A. Day, 66, screw machine products manufacturer, Bristol, Conn., died Jan. 20 at his factory on Riverside Ave.

F. J. Gebhardt, 55, general superintendent of the Struthers-Wells-Titusville Corp., Warren, Pa., died suddenly Jan. 25. He had been superintendent of the company for the past 20 years.

George Edson Shepard, 62, treasurer of the H. B. Smith Co., Westfield, Mass., died Jan. 12 at Westfield. He had been connected with the boiler manufacturing company for 45 years, the last five as treasurer.

Wilmer Wesley Salmon, president of the General Railway Signal Co., Rochester, N. Y., died on Jan. 23 at his New York City home after two months' illness. After long experience as an engineering executive of the Philadelphia & Reading Railroad, he organized the signal company in 1904, becoming its

Goes to Fort Wayne

NEIL CURRIE, JR.

Philadelphia Works Manager

R. V. GOOD

Retired Feb. 1

WALTER S. GOLL

first president. He was managing director of the General Railway Signal Co. of Canada, a trustee of Dickinson College, Carlisle, Pa., and vice-president of the Railway Business Association. He was one of the organizers of what is now the Signal Section, Association of American Railroads.

PERSONALS

JAMES E. DELONG has been appointed general manager of the Waukesha Motor Co., Waukesha, Wis., succeeding the late HARRY L. HORNING, who formed the company 30 years ago.

R. H. AHLERS, factory manager for the Delco Products division of General Motors Corp., Dayton, Ohio, has been appointed general manager of the Delco Brake division, a new organization formed to manufacture a part of the corporation's hydraulic brake requirements.

P. D. PIFER was recently re-elected president of the Fostoria Pressed Steel Corp., Fostoria, Ohio. E. L. BATES and R. J. CARTER were re-elected vice-president and secretary-treasurer, respectively, at the same time.

G. E. WHITLOCK, general manager, and C. C. BIGELOW, treasurer, of City Auto Stamping Co., Toledo, Ohio, have been elected vice-presidents. RALEIGH D. MILLS resigned from the company as vice-president and a director.

FRANK A. SCHOTTERS, formerly vice-president and treasurer of the Luce Mfg. Co., automobile body manufacturers, was elected president at the annual meeting of the stockholders. He succeeds HOMER D. LUCE, who continues as chairman of the board.

NEIL CURRIE, JR., since 1929 manager of the General Electric Company's Philadelphia, Pa., Works, has been appointed manager of the Fort Wayne, Ind., Works, effective Feb. 1, W. R. BURROWS, vice-president in charge of manufacture, announced. Mr. Currie succeeds WALTER S. GOLL who is retiring after 38 years of service with the company. R. V. GOOD, previously assistant manager at Philadelphia, succeeds Mr. Currie.

Mr. Currie joined Western Electric Co. in 1908. When this department was purchased by General Electric Co., he was transferred to Pittsfield, Mass., where he became managing engineer of the company's motor department in 1925, leaving that post for Philadelphia four years later.

Mr. Goll joined the Schenectady Works of the company in 1897, and became manager of the Fort Wayne Works in 1922. Mr. Good came to the United States in 1911, and in 1929 was transferred from the milling machine department to Philadelphia as assistant manager.

R. D. JACKSON has been appointed general manager of the Todd Co., Inc., 1150 University Ave., Rochester, N. Y., manufacturers of "Protectograph" machines, check books and notes. G. N. WOLFE becomes plant engineer and personnel manager and is succeeded as superintendent of the machine division by GORDON J. WATT, who retains his title as production manager of the company.

S. C. PARTRIDGE has been appointed assistant general manager of the industrial division of Timken Roller Bearing Co., Canton, Ohio. He has been with the company for ten years.

ADOLPH F. SCHOEPFLIN, has joined the Doehler Die Casting Co., Toledo, Ohio, as works manager. Previously he had been plant superintendent of the company's Batavia, N. Y., plant.

DR. LEWIS B. STILLWELL, consulting electrical engineer, was awarded the Edison Medal for 1935 on Jan. 29 in New York. The award was made for the recipient's ". . . distinguished engineering achievements and his pioneer work in the generation, distribution and utilization of electric energy." EDWARD B. MEYER, president of the American Institute of Electrical Engineers made the award, which was founded by associates of the late Thomas A. Edison.

JOHN HAYDOCK, managing editor, *American Machinist*, has been appointed chairman of Technical Committee No. 6 on Designations and Working Ranges of Machine Tools, the American Society of Mechanical Engineers. . This is a subdivision of the sectional committee on Small Tools and Machine Tool Elements of which C. W. SPICER, Spicer Mfg. Corp., is chairman. The National Machine Tool Builders Association, the Society of Automotive Engineers, and the American Society of Mechanical Engineers are sponsors of this work.

RALPH R. TODD has joined the Blood Bros. Machine Co., Allegan, Mich. He was formerly chief inspector of all plants, Hudson Motor Car Co., Detroit, Mich.

ALBERT D. WILSON, president of the Bristol (Conn.) Brass Corp., has been elected a director to succeed the late ALEXANDER HARPER. Mr. Wilson succeeded Mr. Harper as president last year.

M. A. CARPENTER has been appointed sales manager of the Falk Corp., Milwaukee, to succeed L. A. GRAHAM, resigned.

F. B. YATES has been appointed head of the New York district office of the Timken Roller Bearing Co., in charge of industrial sales.

Corporation Reports

Company	1935 Earnings	1934 Earnings
Case Co., J. I.	*d*$699,923	.....
Chain Belt Co.	362,091	$209,987
Chicago Electric Mfg. Co.	55,032	67,007
City Auto Stamping Co.	476,138	66,892
Deere & Co.	6,105,452	379,734
Electric Auto Lite Co.	2,588,598	913,681
Fostoria Pressed Steel Corp.	*d*8,501	11,664
Hayes Body Corp.	36,413	.....
Michigan Steel Tube Products Co.	403,239	86,616
Stewart-Warner Corp.	*1,700,000	571,968
Walworth Co.	*d*277,052	*d*234,038

d—Deficit. *—Preliminary.

MEETINGS

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Annual Convention, April 20-21, Adelphia Hotel, Philadelphia, Pa. J. C. MCQUISTON, manager-secretary.

MIDWEST POWER ENGINEERING CONFERENCE & MIDWEST ENGINEERING & POWER EXPOSITION, April 20-24. Palmer House and International Amphitheatre, Chicago, Ill. G. E. PFISTERER, manager, 308 West Washington St., Chicago, Ill.

NATIONAL OIL BURNER SHOW. April 14-18. Convention Hall, Detroit. G. HARVEY PORTER, managing director, Oil Burner Institute, Inc., 30 Rockefeller Plaza, New York, N. Y.

PACKAGING EXPOSITION. Hotel Pennsylvania, New York, N. Y., March 3-6. American Management Association, 232 Madison Ave., New York, N. Y.

SOCIETY OF AUTOMOTIVE ENGINEERS. Tractor & Industrial Power Meeting. April 15-16, Milwaukee, Wis.; National Production Meeting, April 21-24, Detroit, Mich.; Summer Meeting, May 31-June 6, White Sulphur Springs, W. Va. JOHN A. C. WARNER, secretary, 29 W. 39th St., New York, N. Y.

U. S. CHAMBER OF COMMERCE. Annual Meeting, April 27-30, Washington, D. C.

EXPORT OPPORTUNITIES

Paper manufacturing machinery. (Purchase or agency). Montreal, Canada. *101.

Textile cutting and sewing machines, and cotton twisting and spinning machines. (Agency). Capetown, South Africa. *121.

Cotton, absorbent, manufacturing machine (Purchase). Recife, Brazil. *116.

Glass and plate glass beveling, cutting and polishing machinery (Purchase). Casablanca, Morocco. *112.

Machines for working sheet metals, machine tools, drills, broaches, adjustable reamers, measuring instruments, drill-sharpening machines, and pneumatic tool accessories. (Agency). Paris, France. *120.

Dr. Fernando Bernard, 19 Carrera Cuena 19, Quito, Ecuador, want catalogs and prices for Tricot machines for hosiery, sweaters and underwear.

*Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office.

PATENTS

January 28, 1936

Metal-Working Machinery

Die Press Safety System. Carolus L. Eksergian, Detroit, Mich., assigned to Edward G. Budd Manufacturing Company. Patent 2,028,768.

Electric Arc Welder. Masaji Ito, Sumauradori, Suma-ku, Kobe, Japan, assigned to Kabushiki Kaisha Kawasaki Zosensho. Patent 2,028,780.

Machine Tool Feed. Harry F. Vickers, Detroit, Mich. Patent 2,028,850.

Method and Apparatus for Generating Hollow Faced Worms and the Like. Oliver G. Simmons, Lakewood, Ohio, assigned to Dual L. Simmons. Patent 2,028,929.

Tools and Attachments

Riveting Mouse. Andrew D. Baker, Seattle, Wash., assigned to Boeing Airplane Co., Patent 2,028,890.

Processes

Process for Making Tungsten Carbide Castings. Orrin F. Marvin, Los Angeles, Calif., assigned to Mills Alloys, Inc. Patent 2,028,911.

Processing of Metal Parts. De Hart G. Scranton, Maplewood, N. J., assigned to Western Electric Co., Inc. Patent 2,029,037.

Method of Measuring the Hardness of Abrasive Disks. Karl Geppert, Schweinfurt-on-the-Main, Germany, assigned to Kugelfischer Erste Automatische Gussstahlkugelfabrik vorm. Friedrich Fischer. Patent 2,029,066.

Furnaces

Drawing Furnace. Le Roy A. Lindberg, Evanston, Ill., assigned to Lindberg Engineering Company. Patent 2,029,176.

February 4, 1936

Metal-Working Machinery

Control Mechanism for Machine Tools. Alexander Oberhoffken and Hans Hanitz, Rockford, Ill., assigned to Ingersoll Milling Machine Co. Patent 2,029,335.

Roller Attachment. Alfred Hofmann, Palisade, N. J., assigned to Alfred Hofmann Needle Works, Inc. Patent 2,029,372.

Machine Tool. Julian L. Perkins, Springfield, Mass. Patent 2,029,385.

Head Shaping Machine. Thomas A. Richardson, Verona, and Charles W. Dawson, Oakmont, Pa., assigned to Woodings-Verona Tool Works. Patent 2,029,388.

Gear Generating Machine. William E. Sykes, Buffalo, N. Y. Patent 2,029,398.

Hydraulic Ball Race Grinder. Amos P. Steiner, Edgar P. Wine, and Harold E. Balsiger, Waynesboro, Pa., assigned to Landis Tool Co. Patent 2,029,510.

Hydraulic Ball Race Grinder. Amos P. Steiner, Edgar P. Wine, and Harold E. Balsiger, Waynesboro, Pa., assigned to Landis Tool Co. Patent 2,029,511.

Apparatus for Electric Welding. Frank L. Sessions, Lakewood, Ohio. Patent 2,029,594.

Automatic Lathe. Harry W. Ruppel, Shaker Heights, Ohio, assigned to the Cleveland Automatic Machine Co. Patent 2,029,638.

Embossing Apparatus. John J. Braund, Washington, D. C. Patent 2,029,651.

Hydraulic Press. James J. Douglas and George L. Heiden, Milwaukee, Wis., assigned to the Oilgear Co. Patent 2,029,708.

Baling Press. Alfred C. Buttfield, North Plainfield, and Raymond W. Muller, Sewaren, N. J., assigned to the Vulcan Detinning Co. Patent 2,029,984.

Feed Mechanism for Machine Tool Units. Edward Joslin Kingsbury, Keene, N. H. Patent 2,030,007.

Hydraulically Controlled Duplicating Machine. Clifford H. Kain, San Carlos, Calif., assigned to Clement C. Richard and Detroit Trust Co. Patent 2,030,022.

Cutting and Abrading Machine and Process. James F. Williams, Niagara Falls, Ont., Canada, assigned to General Motors Corp. Patent 2,030,023.

Tools and Attachments

Die Mechanism for Mounting Bushings. Fleck W. Sample and Robert D. Ross, Chicago, Ill., assigned to American Flange & Manufacturing Co. Patent 2,030,341.

Gear Cutter. Walter Henry Try, Staines, England, assigned to William E. Sykes. Patent 2,029,399.

Air Nozzle for Flat Spraying Appliances. Eric Gustafsson, Chicago, Ill., assigned to Binks Manufacturing Co. Patent 2,029,423.

Boring Tool. Herman Berg, Cleveland, Ohio, assigned to The Kelly Reamer Co. Patent 2,029,458.

Thread Cutting Tool. Robert Thomson, Arlington, N. J., assigned to Dardelet Threadlock Corp. Patent 2,029,514.

Method of Marking Embossing Dies. William S. Hough, Kokomo, Ind. Patent 2,029,567.

Hydraulic Cushion. Fredrich J. Rode, Toledo, Ohio. Patent 2,029,587.

Drill Jig. William Betz, Detroit, Mich. Patent 2,029,650.

Swaging and Alignment Die. Samuel B. Dallas, Baltimore, Md. Patent 2,029,704.

Recess Forming Punch and Holder. Vincent James Roddy, Providence, R. I., assigned to American Screw Co. Patent 2,029,944.

Chuck. William F. Greene and Walter R. Meyer, Cincinnati, Ohio, assigned to the R. K. LeBlond Machine Tool Co. Patent 2,030,020.

Processes

Method of Making Hollow Forged Valves. William Scrimgeour, Washington, D. C. Patent 2,929,507.

Method of Making Hollow Articles. William Scrimgeour, Washington, D. C. Patent 2,029,508.

Method and Machine for Making Tapered Tubes. George E. Barnhart, Pasadena, Calif. Patent 2,029,552.

Method of Heat-Treating Welded Containers. Harry S. Blumberg, New York, N. Y., assigned to M. W. Kellogg Co. Patent 2,029,807.

Machine Requirements and Industrial Construction

EQUIPMENT WANTED

Conn., Meriden—Hyatt & Duff Co., 381 East Main St.—equipment for textile knitting.

Mass., Springfield—Col. T. J. Smith, Commanding Officer, Springfield Armory, will receive bids until Feb. 17, 2 forging furnaces with automatic temperature control, Circular 114; automatic double end milling and centering machine complete with cams, holding fixtures and motor drive; Circular 111; until Feb. 18 for 3 high speed metal sawing machines, Circular 109.

Mich., Detroit — Deubel Inlaid Art Works, 8726 East Warren Ave.—36 or 40 in. veneer clipping machine.

N. Y., Alden—H. J. Anstett—screw cutting lathe.

N. Y., Jamestown—A.B.C. Plumbing Co., 4th and Washington Sts., Carl Anderson, Mgr.—pipe threading machine.

N. Y., Salamanca—J. McLarney and S. McLarney, c/o McCabe Plant—planer, sanding machine and other equipment for furniture manufacturing.

N. Y., Sherman—Duplex Wrench Corp., 6 or 8 ft. power brake capable of braking up 11 gauge material.

N. Y., Syracuse — Ranin Garment Co., 405 South Clinton St.—cloth doubler and folding machine, also rollers.

N. Y., Syracuse—Syracuse University—paper mill machinery for complete paper plant to be installed in New York State Forestry School.

N. Y., Yonkers—White Swan Uniform Co., 21 St. Casimir Ave., L. Cooper, Pres.—40 sewing machines.

O., Danville—W. L. Blakely—gang saw.

O., Cleveland—New York, Chicago & St. Louis R.R. Co., 1143 Midland Bldg., R. L. Tindal, Purch. Agt.—one 16 and one 18 in. engine lathes with taper attachment and AC electric motor.

Pa., Coopersburg—Dorsey K. Leith—planer, sticker, saws, etc., for lumber yard.

Pa., Franklin—Franklin School Dist., W. O. Phipps, Pres.—complete wood and metal working machinery for vocational department of new junior high school. Bids will be received about April 15.

Pa., Grove City—Harold L. Uber, R.F.D. No. 3—steam boiler, steam engine, hoist, conveyors and other equipment for coal mining development.

Pa., Jersey Shore—Maynard Smith, Railroad St.—lathe, drill, grinder and other equipment.

Pa., Middlebury Center—C. E. Davis—air compressor, portable drill, grinder, small lathe and other equipment for garage and service station.

Pa., New Castle—J. A. Panella Co., J. A. Panella, Mgr.—26 in. wood planing machine.

Pa., Williamsport — Ralph L. Seltzer, 838 First Ave.—machinery and equipment for manufacture of brushes.

S. C., Charleston—Southern Printing & Publishing Co., 125 Meeting St., Albert Orth, Purch. Agt.—two high speed flat bed cylinder presses and 22x34 in. folding machine.

Ont., Amherstburg—Arundel Corp.—machine shop equipment.

Ont., London — London Can Co., Ltd., 367 Thames St., A. Brandes, Owner—can making equipment.

Ont., London—Public Utilities Comn., E. V. Buchanan, Gen. Mgr.—cables, transformer and other equipment for Ann St. substation.

Ont., Thedford—George Coultis & Son—band saw with tilting rolls to take not less than 4 in. saw.

Ont., Toronto—Hydro Electric Power Comn., 620 University Ave., R. T. Jeffery, Engr., will soon take bids for furnishing hydraulic machinery, turbines, generators and equipment for hydro electric power developments on the English River at Ear Falls and on the Albany River at Rat Rapids to supply mines in Patricia District, Northern Ontario.

Que., Manicougan—Ontario Paper Co., Ltd., A. A. Schmou, Supt.—two paper machines with a trim of 250 in.

Que., Montreal—International Bureau of Inventors, Inc., 111 Mappin Bldg.—equipment for small machine shop for light precision manufacturing.

OPPORTUNITIES FOR FUTURE BUSINESS

Ala., Birmingham—Illinois Central R.R. and Central of Georgia R.R., R. R. Cummings, Gen. Mgr. and Ch. Engr., Savannah, Ga., plan to construct a machine shop at Birmingham. Estimated cost $40,000.

Calif., Los Angeles—Federated Metals Corp., 2425 Hunter St., is having plans prepared for two factory buildings at East 26th St. and Indiana Ave. Estimated cost will exceed $37,500.

Calif., Los Angeles — General Motors Corp., General Motors Bldg., Detroit, Mich., has awarded the contract for the construction of an assembly plant on Tweed Blvd., Southgate. Estimated cost $2,500,000.

Ga., Atlanta — Chevrolet Motor Co., Georgia Savings Bldg., J. J. Black, is having plans prepared for an addition to its plant. Estimated cost $300,000.

Ill., Alton—Laclede Steel Co., Alton, plans to construct a steel rod mill. Separate contracts will be awarded for the work. Estimated cost to exceed $100,000.

Ill., Bradley—J. H. Watson Co., contemplates the construction of a metal stamping plant. Estimated cost will exceed $55,000.

Ill., Chicago — International Harvester Co., 606 South Michigan Ave., plans to construct a shop and service building at Logan and Elston Aves. Estimated cost will exceed $45,000.

Ind., Indianapolis—Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill., plans to improve its plant at 21st St. and Northwestern Ave. Estimated cost $60,000.

Ind., Kokomo—Continental Steel Co., Kokomo, plans to construct a continuous sheet bar mill. Work will be done by separate contracts. Estimated cost to exceed $100,000.

Ind., South Chicago — Inland Steel Co. has awarded the contract for the construction of a 46 in. reversing slabbing mill with auxiliary equipment. Estimated cost exceeds $100,000. The company also plans to construct four new open hearth furnaces to cost $100,000.

Mass., Malden—Continental Can Co., Pershing Sq. Bldg., New York, N. Y., J. Fedasky, in charge, contemplates the construction of a plant here.

Mich., Detroit—Wayne Screw Products Co., 521 Jean St., will construct a factory. Work will be done by separate contracts. Estimated cost including equipment, $37,000. H. Angell, 227 East Philadelphia St., Archt.

Mich., Grand Rapids—Fisher Body Corp., division of General Motors Corp., Detroit, has awarded the contract for the construction of a stamping plant, here. Estimated cost $7,000,000.

Neb., Omaha—United Air Lines, 5736 South Cicero St., Chicago, Ill., D. B. Colyer, Pres., contemplates moving its shops from Cheyenne, Wyo., to Omaha, and will be in the market for machinery and tools for engine repair work, radio installation and repairs and general ship overhauling.

N. J., Elizabeth—Phelps Dodge Copper Products Co., South Front St., Elizabeth, N. J., has awarded the contract for an addition to its plant. Estimated cost $37,000.

N. Y., Brooklyn — American Can Co., 230 Park Ave., New York, N. Y., plans to alter its factory at 120 43rd St. Estimated cost including equipment, $37,000.

N. Y., Lockport — Harrison Radiator Corp., Washburn St., has awarded the contract for an addition to its factory.

N. Y., Rochester — Eastman Kodak Corp., Kodak Park, has awarded the contract for a 1 story, 45x60 ft. addition to its factory. Estimated cost $25,000.

N. Y., Syracuse — Continental Can Co., 1 Pershing Sq., New York, N. Y., has awarded the contract for an addition to its plant here. Estimated cost $30,000. Noted Jan. 15.

O., Canton—Hoover Co., North Canton, has awarded the contract for the construction of an addition to its factory for the manufacture of a new model sweeper. Estimated cost $100,000.

O., Cincinnati — Century Machine Co., 4434 Marbury Ave., plans to construct a factory. Estimated cost including equipment, $37,000. Tietig & Lee, 344 West 6th St., Archts.

O., Cleveland — Midland Steel Products Co., Madison Ave. and West 106th St., has taken over the plant of the former Winton Motor Co. and will alter and equip same for its own use. Estimated cost $37,000.

O., Cleveland—John C. Virden Light Fixture Co., 6001 Longfellow Ave., John C. Virden, Pres., has awarded the contract for an addition to its factory. Estimated cost $40,000.

O., Mansfield—Empire Sheet & Tin Plate Co., plans to construct an addition to its plant. Estimated cost $300,000.

O., Martins Ferry — Wheeling Steel Co., Wheeling, W. Va., plans to improve its steel furnaces here. Estimated cost to exceed $50,000.

O., Steubenville—Wheeling Steel Co., Wheeling, W. Va., plans improvements and additions to its iron and steel products manufacturing plant here. Estimated cost including equipment $500,000.

O., Toledo—Interlake Iron Corp., 2401 Front St., will construct a factory for the manufacture of iron paving plates. Estimated cost $100,000.

O., Yorkville—Wheeling Steel Corp., Wheeling, W. Va., plans to alter its steel finishing plant here. Estimated cost $100,000.

Pa., Pottstown—Doehler Die Casting Co., 2100 Smead Ave., Toledo, O., plans to alter and recondition its factory at Pottstown, Pa. Estimated cost $200,000.

S. C., Union—Union Iron Foundry Co., contemplates the construction of a foundry. Estimated cost including equipment $37,000.

Tenn., Memphis — Continental Can Co., 1 Pershing Sq., New York, N. Y., has awarded the contract for an addition to its factory here. Estimated cost $80,000. Noted Jan. 15.

Wash., Seattle — American Can Co., 615 Orchard St., has awarded the contract for the construction of a pattern shop. Estimated cost $40,000.

Wash., Seattle — Continental Can Co., 615 Orchard St., has awarded the contract for an addition to its plant here. Estimated cost $110,000.

Wis., Milwaukee—Monarch Tool & Die Works, 815 West Juneau St., has awarded the contract for the construction of a 1 story, 52x120 ft. factory.

Canada — Canadian National Rys., Board of Trade Bldg., Montreal, Que., plans repairs and betterments to equipment in its shops at Moncton, N. B., Riviere du Loup, St. Malo and Point Charles, Que., London and Stratford, Ont., Transcova and Fort Rouge, Man., and Edmonton, Alta. Estimated cost $1,000,000.

Ont., New Toronto — Continental Can Co., Pershing Sq. Bldg., New York, N. Y., has awarded the contract for the construction of a factory on Birmingham St. Estimated cost $500,000.

Ont., Oshawa — Lakeside Publications, Ltd., plan to construct a printing plant. Estimated cost $40,000.

P. E. I., Charlottetown—Stinson Aircraft Co., of Canada, Ltd., plans to construct a factory here. Estimated cost $50,000.

Que., Montreal—Electric Switch Gear Ltd., F. G. Bush, Pres., plans to construct a factory. Estimated cost $30,000.

American Machinist — REFERENCE BOOK SHEET ©

High-Strength Chromium-Nickel Steels

The American Society for Testing Materials published in 1935 the "Tentative Specifications for High-Strength, Corrosion-Resisting, Chromium-Nickel Steels (Sheet and Strip)." The tentative standard, designated as A 177-35T, is reproduced in its entirety through the courtesy of the Society

Scope

1. These specifications cover high-strength corrosion-resisting chromium-nickel steel sheet and strip. The terms sheet and strip as used in these specifications apply to the following:

Sheet includes products less than $\frac{7}{32}$ in. in thickness and 24 in. and over in width.

Strip includes products 0.175 in. and less in thickness and under 24 in. in width.

Process

2. The steel shall be made by the following processes: electric-arc, electric-induction, or other approved processes.

Discard

3. A sufficient discard shall be made from each ingot to insure freedom from injurious piping and segregation.

Chemical Composition

4. The steel shall conform to the following requirements as to chemical composition:

Ladle Analysis

5. An analysis of each melt of steel shall be made by the manufacturer to determine the percentages of the elements specified in Section 4. The analysis shall be made from drillings taken at least ¼ in. beneath the surface of a test ingot made during the pouring of the melt. The chemical composition thus determined shall be reported to the purchaser or his representative, and shall conform to the requirements specified in Section 4.

Check Analysis

6. If check analysis is specified by the purchaser, it shall be made from drillings or millings as taken from the finished material or from a broken test specimen. The chemical composition thus determined shall conform to the requirements specified in Section 4.

Temper

7. The various tempers procurable in sheet and strip shall be as indicated in the following table:

Quarter Hard Temper
Half Hard Temper
Three-Quarter Hard Temper
Full Hard Temper

Tension Tests

8. (*a*) When specified by the purchaser, the material shall conform to the requirements as to physical properties given in table at left.

(*b*) The yield point shall be determined by the dividers method.

(*c*) In making tension tests reference should be made to the Standard Methods of Tension Testing of Metallic Materials (A.S.T.M. Designation: E 8) of the American Society for Testing Materials.[1]

Bend tests

9. (*a*) The bend test specimens shall stand being bent cold through the required angle indicated in the following table, without cracking on the outside of the bent portion. See table at left.

(*b*) One bend test specimen shall be bent in the longitudinal and one in the transverse direction.

(*c*) The radius of the bend shall be equal to "*N*" times the thickness of the specimen. The values for "*N*" are indicated in the table in Paragraph (*a*).

Test Specimens

10. (*a*) Tension test specimens shall be taken from finished material and shall be in the longitudinal direction. The tension specimens shall be of the full thickness of the material and shall conform to the dimensions shown in Fig. 1.

(*b*) Bend test specimens from sheet and strip less than $\frac{7}{32}$ in. in thickness shall be the full thickness of the material. The longitudinal bend test specimen from strip less than 1 in. in width shall be the width of the material. The width of specimens over 1 in. in width shall be six times the thickness but not less than 1 in. When

[1] 1933 Book of A.S.T.M. Standards, Part I, p. 94 9

Chemical Composition

Carbon, max., per cent	0.12[a]
Manganese, max., per cent	0.60
Phosphorus, max., per cent	0.035
Sulfur, max., per cent	0.035
Silicon, max., per cent	0.75
Chromium, min., per cent	17.0
Nickel, min., per cent	7.0

[a] For material of three-quarter hard and full hard tempers a carbon content of 0.15 per cent, maximum, is permissible.

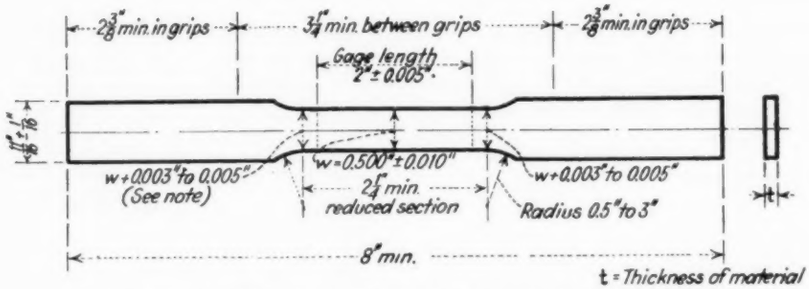
Physical Properties

Temper	Tensile Strength, Lb. Per Sq.In.	Yield Point, Lb. Per Sq.In.	Elongation in 2 In., Per Cent: Up to 0.015 In. Thick	0.016 to 0.030 In. Thick	0.031 In. Thick and Over
Quarter Hard	125,000	75,000	25.0	25.0	25.0
Half Hard	150,000	110,000	9.0	10.0	10.0
Three-Quarter Hard	175,000	135,000	3.0	5.0	7.0
Full Hard	185,000	140,000	3.0	4.0	5.0

Bend Test Specifications

Temper	0.030 In. Thick and Less: Angle, Deg.	*N*	0.031 to 0.050 In. Thick: Angle, Deg.	*N*	0.051 In. Thick and Over: Angle, Deg.	*N*
Quarter Hard	180	1	180	1	90	2
Half Hard	180	2	180	4	90	2
Three-Quarter Hard	180	4	90	2½	...	..
Full Hard	180	6	90	3½	...	..

High-Strength Chromium-Nickel Steels


2⅜" min. in grips
3¼" min. between grips
2⅜" min. in grips
Gage length 2" ± 0.005"
w + 0.003" to 0.005" (See note)
w = 0.500" ± 0.010"
2¼" min. reduced section
w + 0.003" to 0.005"
Radius 0.5" to 3"
8" min.
t = Thickness of material

Note: Gradual taper from ends of reduced section to middle
All machining dimensions are shown below and testing dimensions above specimen

Fig. 1—Standard Tension Test Specimen for Sheet and Strip Materials

possible, the length shall be at least 6 in. The transverse bend test specimen shall have a width six times the thickness of the material but not less than 1 in. The length shall be equal to the width of the sheet or strip, but in no case longer than 12 in. The edges of the test specimens may be rounded to a radius equal to one-half the thickness.

Number of Tests

11. Two tension tests and two bend tests shall be made on each lot of material, a lot consisting of 100 or less each of sheets or strips, and in no case less than 1,000 lb. from the same melt of steel and the same specified thickness.

Special Tests

12. If any special tests are required which are thought to be pertinent to the intended application of the material ordered, they shall be as agreed upon between the purchaser and the manufacturer or as specified in the purchase order.

Thickness Tolerances

13. (*a*) Material up to 24 in., inclusive, in width shall not vary from the thickness specified by more than ± 5 per cent of the ordered thickness, except that in no case shall the minimum thickness tolerance be less than ± 0.001 in.

(*b*) For material over 24 in. in width the thickness tolerances shall be as agreed upon between the purchaser and the manufacturer.

(*c*) In determining thickness the material shall be gaged ⅜ in. from the edge and may be thicker at the crown (center) than at the edge by one-half the thickness tolerance taken one way.

Camber Tolerances

14. (*a*) Material up to and including 1½ in. in width shall not have a camber exceeding ½ in. in 8 ft. or less.

(*b*) Material over 1½ in. in width shall not have a camber exceeding ¼ in. in 8 ft. or less.

(*c*) Camber shall be measured by placing a straight edge against the concave edge of the sheet or strip.

Flatness Tolerances

15. (*a*) Material shall not have buckles exceeding the following limits:

0.016 in. and under in thickness	⅛ in.
0.016 in. to 0.030 in. in thickness	¼ in.
0.030 in. in thickness and over	½ in.

(*b*) The height of buckle shall be determined by measuring the distance from a flat surface on which the sheet or strip lies to the maximum rise of the sheet or strip.

Width Tolerances

16. (*a*) *Sheets.*—For non-resquared sheets the width shall not vary more than ¼ in. over the ordered size. For resquared sheets the width shall not vary more than 1/16 in. over the ordered size. No variations under the specified width are permissible.

(*b*) *Strip.* — The width of strip material shall not vary from the specified width by more than ± 1/32 in.

Other Tolerances

17. Tolerances closer than or other than those shown in Sections 13 to 16, inclusive, shall be as agreed upon between the purchaser and the manufacturer.

Workmanship and Finish

18. (*a*) The surface finish shall be as cold rolled or as otherwise designated.

(*b*) The material shall be free from injurious defects, shall have a workmanlike appearance and shall correspond to the designated finish as indicated in Paragraph (*a*).

Inspection

19. The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications, except when an agreement has previously been made between the manufacturer and purchaser regarding the cost of such tests. All tests (except check analyses) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Rejection

20. (*a*) Unless otherwise specified, any rejection based on tests made in accordance with these specifications shall be reported within ten days from date of test.

(*b*) Material which shows injurious defects subsequent to its acceptance at the manufacturer's works shall be rejected and the manufacturer shall be notified.

Rehearing

21. Samples tested in accordance with these specifications, which represent rejected material, shall be preserved three weeks from date of the test report. In case of dissatisfaction with the results of the tests, the manufacturer may make claim for a rehearing within that time.

The Round Table

NEW TRICKS

"How is the new foreman making out, Al?" asked Ed, when he visited the compressor shop the other day.

"I'm not just sure, Ed. Wish I was. If I knew positively I'd either raise his wages or fire him."

"That doesn't seem to make sense!"

"What I mean is this, Ed. If he's as good as he tries to make me believe, he's worth more money. But if he's as bad as I'm afraid he is, I don't want him."

"That still sounds like a riddle to me, Al. Trying to make epigrams?"

"Not a bit. I'm just trying to decide what I ought to do. I'm afraid Bill's one of those smart guys who thinks he knows about all there is to know, and wants every man to do things his way."

"Well, isn't a foreman supposed to know all about the work? Don't you want him to show the men who don't know how?"

"Sure thing, Ed. What makes me suspicious is to find him trying to show men who know more than I think he does. Old Jim Weston got peeved the other day because Bill wouldn't let him use his pet indicator on a job. Insisted that he use one Bill had, which wasn't half as good as Jim's. That was one thing that opened my eyes a bit."

"But isn't it a foreman's job to show men the latest methods? If you have to hire men with little experience, I should think you'd want a man who could show them how to do things."

"You're partly right, of course, Ed. But as I see it, the foreman's main job is to get out work that is satisfactory and at a minimum cost. That means utilizing every ounce of brain in the shop, including his own. And I've never yet seen the foreman who had all the brains in the shop—not even you, Ed."

"Thanks for the compliment, Al. But if I didn't know more than my men why am I a foreman?"

"Even that may be open to question, Ed. Of course you know more about the general problems of getting out work. But I don't believe for a minute that you know more about every job than the chap who does it day after day. If the man knows how

to do a good job in the time that's satisfactory to me, I don't care whether he does it my way or not. The more the foreman encourages the men to find better ways, the better for us and for the men too. That's why I'm beginning to think Bill isn't on the right track."

"Don't believe I'd like to work for you after all, Al."

"Just as much as I'd like to have you, Ed."

Is Al right in objecting to too much instruction? Or is the new foreman right in insisting that the men follow his ideas?

DISCUSSION

Black List

Al's stand is best in the long run for his company, his men and the whole community. The thick skinned ownership of help practiced in many communities has prevented industrial growth and has sowed the seeds of decay in once live industrial towns.

Several times when I was placed in charge of a plant, the board stressed the fact that the manufacturers in the town had a "gentlemen's agreement" which did not allow hiring employed help from another factory. After observing the efficiency of the help I found in my plant, the need of strengthening the personnel in various departments and getting the facts on desirable men in other plants in the community, I have finally gone to the mat with the board and given them my opinion of their gentlemen's agreement. Then I broke their hide-bound employment policy and went out and got the men necessary to make the factory organization into a real production unit. If the board didn't like my action they had the privilege of securing somebody else to take my place.

In my younger days I was used to seeing skilled men highly efficient in the shoe factories get paid a fair rate for their work; especially was it true of the Goodyear stitchers, roughrounders and welters. The first jolt I received in getting out into the more enlightened trades was when a raise was suggested for a maintenance machinist, who was saving about $40 a day for the company. My boss said that

$2 a ten-hour day was the limit, regardless of the man, because it would overset the wage scale in other departments to pay this man more. Result the man quit the job; we replaced him with three $1.80 a day men and had on an average of two $24-a-day pieces of equipment idle all the time.

Al should consider the effect on other firms and on the community because he will be civilizing certain breeders of radicals and communists and giving the community a good name throughout industry. The sooner he can get some underpaid valuable men from these righteous pay envelope dwarfers, the sooner a fair wage will prevail in the community's plants. He can create an employer attitude of "how much a man can be worth to us" and not "how little can we pay John and still hold him." If an aggressive, comfortable living community is a business sin, let me be a sinner with live neighbors.

—E. E. Gagnon.

Purchased Parts

Al should not be over-enthusiastic because of a sudden pouring in of orders. Time and again that has happened to others, only for a sudden drop to come and for a new low to be recorded in the business graph. Of course, should the orders be in the form of contracts extending over a period of months, then the matter becomes entirely different and Al would be well warranted in enlarging his plant.

Farming out parts is today a recognized practice in manufacturing. Parts can often be made more cheaply and as well by outside concerns. That outside concerns cannot produce quality products is a needless fear. They are as anxious to supply quality products as are the manufacturers.

There is one other important point that should not be overlooked. Buying parts from outside will give the buying concern a chance to keep operating on an even keel and to observe business trends over a period of time. There is no need for rushing into expansion. Should continued betterment of business warrant it, then it is still not too late to expand.

—Will Herman,
Superintendent,
Tanenbaum Oil Company.

Al will make no mistake if he farms out his extra work to shops that are properly equipped and have the necessary experience to handle it. If he uses judgment in picking the right shops and provides adequate specifications and gages, he will get satisfactory work, and the prices should furnish a check on his own costs. He will know his exact costs on all parts made outside and may find that specialists in certain classes of work can produce parts at a lower price than he can hope to make them.

I am speaking from experience. When rushed to fill orders, we have found it profitable to farm out work to a number of capable small shop owners who are personally interested in and responsible for qualities and deliveries of the work. Such work has included toolmaking, press work, screw machine work, plating, cold heading and other operations, where specialists can beat the general production shop. I believe that the advantages of this plan far outweigh any objections to it.

—Herbert M. Darling,
Superintendent, Wells Tool Company.

Extra Dividends

There is a peculiar thing about extra dividends. They are usually spent for luxury items that could be done without, and then they are gone. Before we know it, clouds loom on the business horizon and ordinary dividends are scarce. Indeed, business itself sometimes vanishes and the source of ordinary dividends dries up.

Since we are still far from the business millenium, I think Al has the right idea about omitting the extra dividends and using the surplus to build up a reserve after having taken care of equipment obsolescence, which, of course, comes under the head of depreciation.

The bargain machine tools that have served the partners so well have outlived their economic usefulness and must be replaced if the competition that prosperity always brings is to be met. Machine tools of 1935 are so far ahead in production efficiency of those built in pre-depression times that comparison is ridiculous.

Ed is still living in the days when "melon" cutting was an accepted part of profitable business, and he is oblivious to the headaches which that type of overindulgence always brings. But Al believes that prevention is better than cure and is determined to keep a tight rein on the purse strings, except for essentials like new equipment. More power to him.

—Robert S. Alexander.

Group Training

It has been demonstrated more than once that with the method of group training advocated by Al, it does not take long to make some good operators; that some men will work overtime to learn things to make them of more value to their employers; and that some men will jump at a chance for a job that promises to be permanent. Also that some unforeseen thing will make a valuable man out of a declared ne'er-do-well.

Any foreman who has gone through a strike period with green help has found that a few men can quickly learn, not only the fundamentals of machine work, but the nice points also. Throughout one strike it was found that, given the right instructor, some good operators could be made in six months.

A complete success just can't be made of any plan of training that does not consider the mental capacity of the one being trained. Help everyone you can, but allow for mental traits and let them forge ahead if they are able.

Community training will not pay any more than a manual training school will pay in training high-school boys. It's too costly and is money thrown away. The occasional boy will get his training elsewhere and anyway. Why throw away money to get that occasional one? —C. G. Williams.

One-Man Shop

Al, if he thinks it out, having the interest of the business at heart, will realize that he must have an understudy. He is right in his view that such a man should be given definite authority.

A good man, equal to being the understudy of his chief, but who has no authority, is placed in an almost impossible position if and when the chief happens to be away. While there is likely to be some jealousy, should he be given the necessary authority, there will be far less friction than will result if he has to take over without specific authority.

Much, too, depends upon the personality of the understudy. He can entirely disarm all except ill-natured criticism by his conduct of affairs and his attitude to the men under him. There are few men who prefer that all promotions shall invariably be won by outsiders. They like to feel that they have a chance to make good and win promotion with the plant they know.

Generally the reason a foreman seeks to keep all the power in his own hands is the fear that another will supplant him. The responsible employer recognizes in the success of a foreman-coached man a sign manual of that foreman's excellence at his job.

—W. R. Needham,
Stafford, England.

IF THE WORKER ONLY KNEW—

Would he favor the Townsend Plan?

"WALKING home, Bill?" Sam asked the question as he and Big Bill brushed up the chips that had been bouncing from their planers to the floor and out into the aisle.

"Sure, Sam. You walking? Something on your mind?"

"Yeh. Got somethin' I want to talk about."

Hands cleaned and overalls already off, the two men locked their tool chests just as the whistle blew and headed for the time clock and the main gate.

"What is it, Sam?" asked Bill as they stepped through the gate.

"It's that Townsend Plan. Lots of the fellows say it's coming and if we can just keep going till we're 60, we'll be fixed for life. Seems to me that with all your readin' you ought to know if it'll work."

"Well, I'll give you my honest opinion, Sam. I've made up my mind, all right. Partly from reading, I guess, and partly from just common sense. You know what the plan is, don't you?"

"Guess so. The way I get it, the idea is that when a person reaches 60 he stops work and the government pays him $200 a month the rest of his life."

"Yes, that's it. But there are a few items you didn't mention. The $200 has to be spent during the month received. And the money has to be raised by us workers. And—"

"Wait, a minute, Bill. How come *we* have to raise the money? Doesn't it come from Washington?"

"Sure it does. But where does Washington get it? From taxes. And we pay the taxes."

"Well, that might make a difference. Seems to me taxes are high enough now. Would there have to be extra taxes for the pensions?"

"*Would* there, Bill?" *I'll* say there would. You know the state sales tax you gripe about. Well, that's *nothing*. For those Townsend pensions you'd have a *transactions* tax. Every time something changed hands there'd be a tax.

You'd get ham and egg instead of ham and eggs for breakfast—and a mighty small piece of ham, too

"TAKE eggs. You'd get ham and *egg* instead of ham and *eggs* for breakfast—and a mighty small piece of ham, too. The hen that laid the eggs would have been born from a taxed egg in a taxed incubator, and raised on taxed food. Then her eggs would be taxed when the wholesaler bought them from the farmer. Again when the jobber bought them. Again when the grocer bought them. And once more when your wife bought them.

"You can figure the same thing out on your rent, coal, light, gas, clothes, smokes—even carfare."

"But I couldn't afford to pay all those taxes, Bill."

"Course you couldn't. But you would, if you had the Townsend Plan. You just wouldn't buy as much stuff as you do now. Neither would I. And neither would anybody else. Of course the people over 60 would have more to spend, but it would be money that you and I and a lot of other people donated. So total spending wouldn't be any greater."

"But the way it was explained to me, the plan would make more sales and more work."

"How could it, Sam? Take 1933, for example, just because I happen to remember the figures. The country had $48,000,000,000 of business. That averaged four billions per month.

"Now suppose we had started paying the $200 a month on the first of February. There were ten million people over 60. Multiply ten million by $200 and you get $2,000,000,000 that would have had to be collected during January.

"But there was only four billions of business. Take two billions out of that for old age pension tax and there would have been just two billions left to spend.

"Then in February there would have been the normal four billions again plus the two billions set aside in January for the old folks, making six billions in all.

"The first thing, though, two of those six billions would have been taken as tax for the old people to spend in March, which would have left only four billions to be spent in February.

"The same thing would have happened every month in 1933. And that's just where we started—with four billions a month to spend. The only difference would have been that those who had money to spend to start with would have passed a third to a half of it over to other people to spend."

"And is that all, Bill?"

"It's enough, isn't it? But at that it's not all. Some more taxes would have had to be collected to pay a force of bookkeepers to keep track of the taxes, and payments, and age records, and applications for pensions—and the checkers to watch the old folks to see that they didn't save anything and didn't work."

"Don't tell me any more, Bill. I've got a headache now."

"All right. You're practically home anyway. But if you have a headache now, how would you feel if you had to begin tomorrow to raise your share of that $2,000,000,000 every month? Goodnight, Sam. It's only a dream so far. Let's hope it doesn't turn into a nightmare."

Reprints of this article, in pamphlet form, suitable for distribution in pay envelopes, can be secured at relatively small cost

Ideas FROM PRACTICAL MEN

Three-Station Press Tools

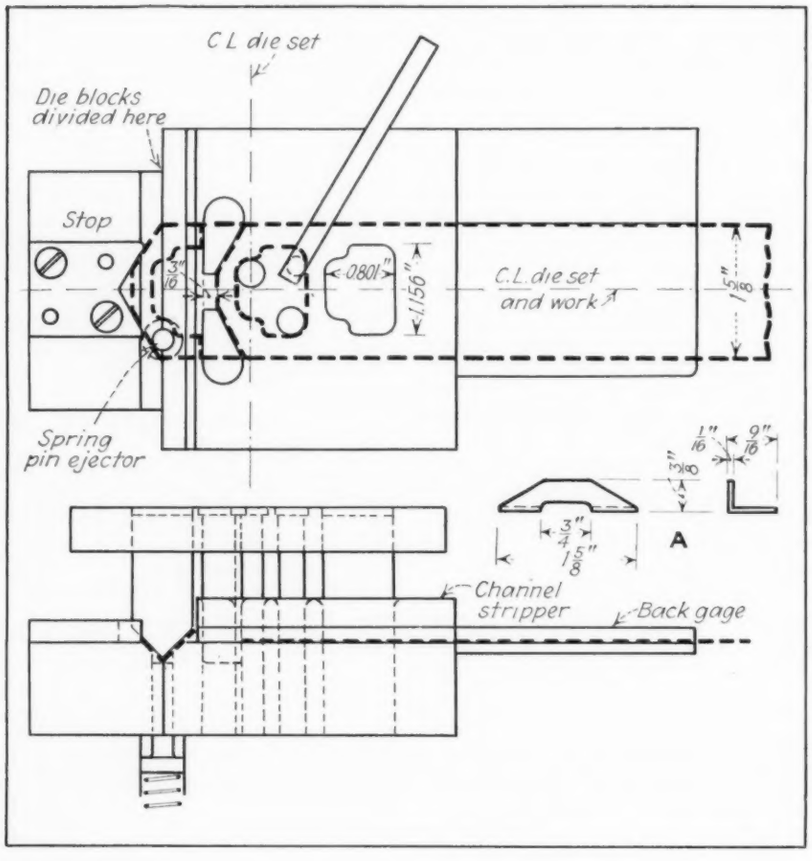
C. W. HINMAN

The press tools illustrated diagrammatically are for producing the work *A*, which is made from strip steel $\frac{1}{16}$ in. thick and $1\frac{5}{8}$ in. wide. The tools are a typical design for handling small work and are so simple as to need little description. There are three work stations, namely, blanking the center opening, automatic stop and piloting, and cutting off and forming the 90-deg. angle in a V-block.

A single spring-actuated pin in the forming die ejects the work when the ram ascends, causing the piece to slide off behind the inclined press.

The blanked opening in the strip is made 0.801 in. wide, which allows $\frac{1}{16}$ in. waste in cutting off the final piece. The piece is severed from the strip just before the forming operation.

A casual inspection of the design of these tools will reveal that there was no other practical tool design for producing this troublesome little piece in one operation.



The center opening in the strip is blanked and the work is cut off and formed in these three-station tools

Welding and Shaping Gear Teeth

H. M. JAMES
James Machine Works

Sometimes we are called upon to build up damaged or broken teeth in cast-iron gears by depositing metal by the welding process. While the technique of putting on metal to build up gear teeth by means of the gas torch is well known to nearly every up-to-date jobbing shop, a simple and rapid method of grinding the teeth to the correct shape and thickness is not so well known to every welding operator.

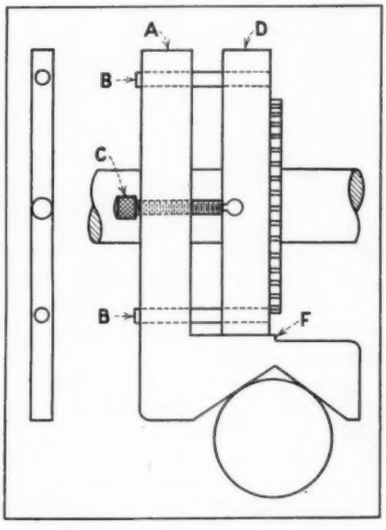
After the gear has been properly heated, the broken or damaged teeth are built up to the approximate shape, but slightly oversize. While the gear is cooling off, a babbitt metal cast is made of one or two teeth from the undamaged part of the gear to be used as a gage. The built-up teeth are then ground to the correct size and shape by a hand grinder having a wheel to suit the work, using the babbitt metal cast as a gage or templet.

Gage for Setting Underwidth Cutters

FRANK MOORE
Hamilton, Ontario, Canada

Keyways, slots and the like often have to be finished in two cuts because many small shops do not have a complete assortment of cutters. A cutter narrower than the keyway is used and is set over a certain amount each side of the center to make up the width.

The gage illustrated is useful in the setting over operation. The body *A* is L-shaped and has a V at the bottom. It is a sliding fit on the pins *B* and is tapped for the adjusting screw *C*. Part *D* has a hole drilled to fit the ball on



By means of this gage cutters may be accurately set to cut keyways or slots

the end of the adjusting screw, a slot being provided for the neck behind the ball. The shoulder *F* is in line with the center of the V.

To set the gage, the adjusting screw is turned until the face of part *D* is one-half the width of the keyway from shoulder *F* by scale measurement. In use, the gage is placed against one side of the cutter and the work is adjusted to bear equally on each side of the V. After the first cut has been made, the gage is placed against the oposite side of the cutter and the work is adjusted as before.

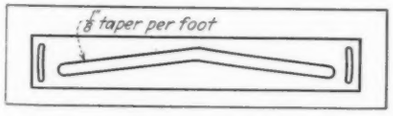
Crowning Pulleys

O. D. BRADSHAW
Fredericton, New Brunswick, Canada

We had a large quantity of 8x4-in. pulleys to bore and crown, the crowns being tapered ⅛ in. per ft. The hubs were enough longer than the width of the faces to be held in the chuck, so that the pulleys could be bored and crowned at one setting. When turning the crowns, the pulleys were supported by a revolving pipe center held in the tailstock spindle.

To avoid having to set the taper attachment for each angle of the crown, we made the guide plate illustrated and clamped it to the taper bar in place of the usual sliding block. A shouldered stud carrying a roller engaging the angular slot in the guide plate was put in the connecting link to the toolblock.

The guide plate was set so that the apex of the angular slot was central



A roller engaging the angular slot in the guide plate is mounted on a shouldered stud attached to the usual connecting link to the toolblock

with the face of the pulley. By holding each pulley at the same distance from the face of the chuck and setting the tool to the center of the pulley face, it was easy to crown each one without resetting the attachment.

Marking Drafting Tools

ROBERT BRYSON

A method of marking names on drafting tools without an elaborate equipment is first slightly to roughen the surface on which the name is to be lettered with fine sand paper and then to mark the name with india ink on the roughened surface.

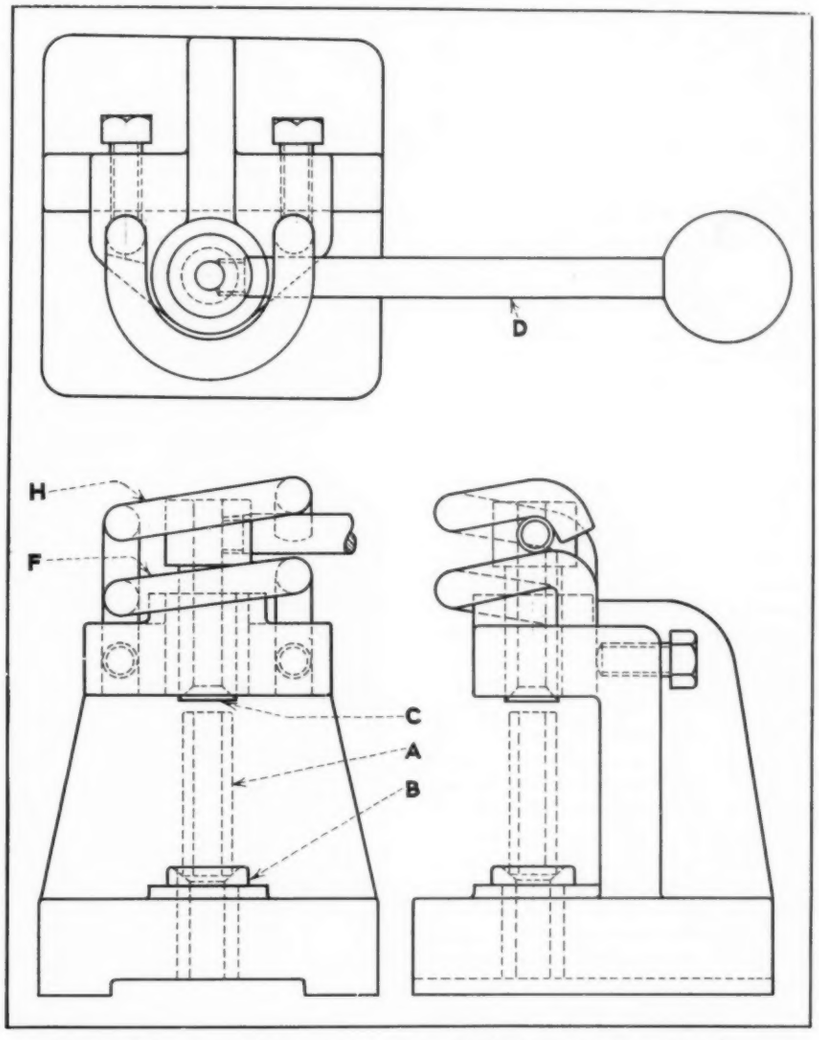
After the ink has thoroughly dried, cover the lettered area with Ambroid cement and allow it to dry. The cement forms a dull, transparent film over the letters and is proof against the abrading effect caused by sliding the tools over the drawing.

Quick-Acting Drill Jig

EDWARD L. PETERSON

The drill jig illustrated is for drilling and reaming axial holes in cylindrical work. The work *A* is clamped between the bushings *B* and *C*, which are countersunk at an angle of 45 deg. on the ends contacting the work. The lower bushing is pressed tightly into the base of the jig, while the upper bushing is a slip fit inside a liner bushing in the bushing plate. The lever D is attached to the upper bushing and is used for clamping and releasing the work. It rotates between the hardened and helically bent steel rods *F* and *H*, which are attached to the bushing plate by one end, forming a right-hand helix having an angle of about 10 degrees.

When the lever is rotated in a clockwise direction, the upper rod *H* acts as a cam and forces the lever and the upper bushing down, clamping the work. When the direction of the lever is reversed, the lower rod *F* acts as a cam and raises the lever and the upper bushing and releases the work. By leaving one end of each rod free, the clamping action is more satisfactory than would be the case if both ends were anchored. When the jig is used for reaming, it is, of course, necessary to replace the upper bushing with one of reamer size.



The work is clamped between the upper and the lower bushings by a lever rotating between two helically bent rods anchored in the bushing plate

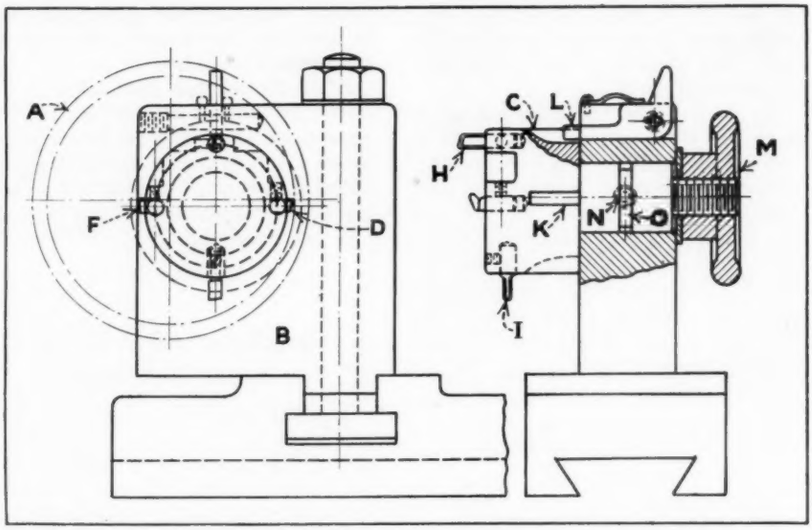
Turret Toolpost for the Engine Lathe

JOHN A. HONEGGER

We had to make several thousand rings of the type shown at *A* from pot castings. The price per ring was such as to necessitate the employment of turret-lathe methods, but an engine lathe only was available.

To obtain maximum output at a minimum cost, the turret toolpost illustrated was designed. It consists of the block *B* fitted to the T-slot of the lathe toolblock and held by a bolt. In this block is fitted the shank of the turret *C*, the turret holding the boring tool *D*, the turning tool *F*, the facing tool *H*, and the cut-off tool *I*. On the outer diameter of the turret are cut four indexing slots such as the one at *K*, into which the spring latch *L* engages.

After being indexed to bring the desired tool into cutting position, the turret is clamped by the hand nut *M*. To prevent the turret from moving endwise when it is unclamped, the screw pin *N* passes through block *B* and its point engages the groove *O* in the turret shank.



By means of tools held in a turret-type toolpost fitted to an engine lathe, pot castings were bored, turned, faced, and rings were cut from them at minimum cost

Two More Uses for the Combination Square

J. H. DAVIS
Wembley, Middlesex, England

After reading the article "Simple Fixture for Testing Squares" (*AM*—Vol. 79, page 375), I was reminded how I once settled an argument about the accuracy of a small square by means of the protractor head and the scale of a combination square.

With the stock of the square to be tested placed on the protractor head, as shown in Fig. 1, the scale was adjusted so that when the blade of the square was brought into contact with it, no light could be seen between them. The square was then placed on the protractor head on the opposite side of the scale with its blade in contact with the scale. Any error in the accuracy of the square would be shown by light seen between its blade and the scale, the error being doubled.

A method of checking the correctness of the angle on the head of valves for automotive engines is illustrated in Fig. 2. The regular stock and the center head of the combination square are put on the scale and are adjusted so that the valve stem will pass between them. The valve head is then brought into contact with the angular surfaces of both heads and the correctness of the angle is readily checked.

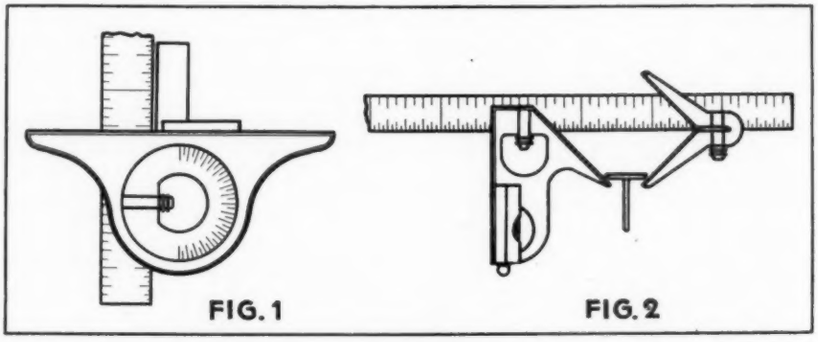


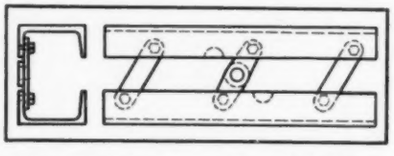
Fig. 1—The accuracy of a small square was tested by the method described. Fig. 2—Correctness of the angle on the heads of valves for automotive engines can be checked by contact with the two heads

Permanent Parallels for the Drill Press

STANLEY BALDWIN

To prevent the tables of drill presses from being scarred when drills come through work that is not blocked up, one shop has equipped its drill presses with permanently attached but adjustable parallels that are made on the principle of the well-known parallel ruler, as shown in the illustration.

The parallel members are pieces of channel iron, pack-hardened and ground and are connected by pivoted links. The complete assembly is attached to the drill press table by a bolt through the middle link. When this bolt is loosened, the distance between the parallels can be varied within the range permitted by the links. The channel irons are of such size as will permit ordinary downward projections on work placed on them to clear the drill press table.



The parallels are on the principle of the parallel ruler. They are attached to the table by a bolt through the link in the center

Angular Machine Settings

Many seem to overlook one of the good features of individual motor drive, the ability to place machines at any desired angle. This is frequently advisable on account of light, the handling of bar stock or for convenience of the operator on more than one machine. Angular location is also secured in some group drive layouts where conditions warrant it and permit suitable shaft arrangement.

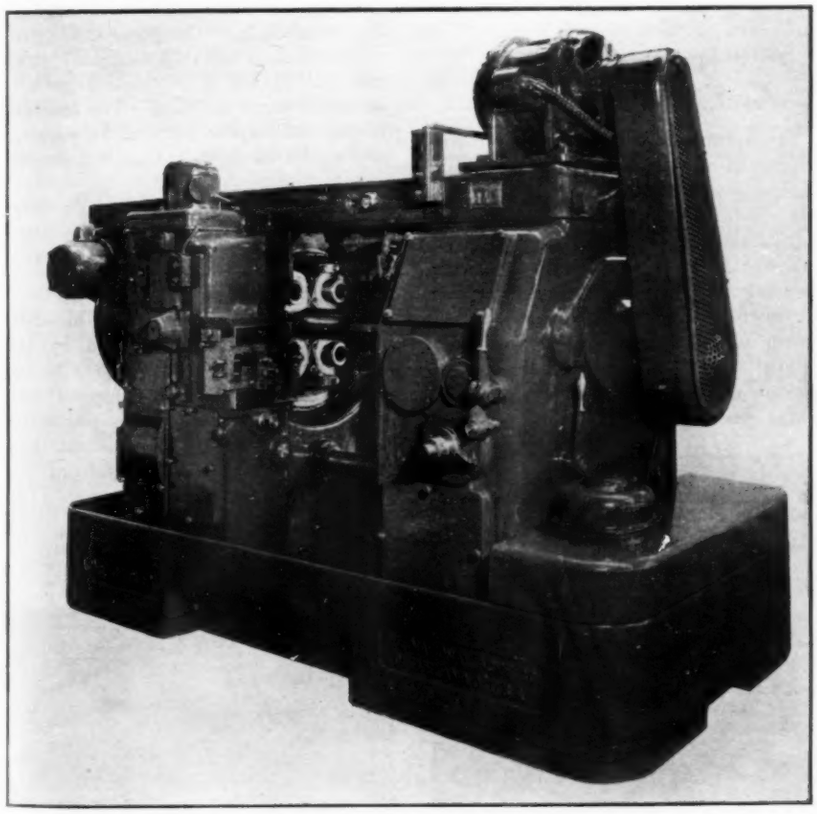
Shop Equipment NEWS

National Acme "Model RP" Automatic Chucking Machines

Automatic chucking machines of new design have been announced by the National Acme Company, Cleveland, Ohio. These will be known as the "Model RP" and are available in both four- and six-spindle types. This model is intended for heavy duty, and presents new standards of accuracy.

The machine has a capacity for 8 in. swing. As work of this size is often heavy, loading is done in the upper front position and the pan is arranged so that the operator can stand very close to the machine, putting the piece into the chuck with his right hand, without reaching away from his body, thus avoiding fatigue and strain. The center line of the spindle at the loading position is only 44 in. above the floor.

A push-button station mounted near his left hand permits control of the electric chuck so that while he holds the piece in the chuck with one hand, he can with the push-button station close or open the chuck jaws at will. Variations in the diameter of the piece chucked do not affect the force with which it is gripped, as the motor simply travels a few more revolutions to compensate for errors in diameter. After the piece is chucked, the operator, by using another push-button station, (also mounted conveniently at his left hand) can rotate the spindle independently of the main drive, and make sure that the piece he has just chucked is not running out. It is possible to rechuck and reset the piece in a moment so that it runs true.



Front or loading side of machine showing "Cut Out" in pan so that operator may stand close to machine

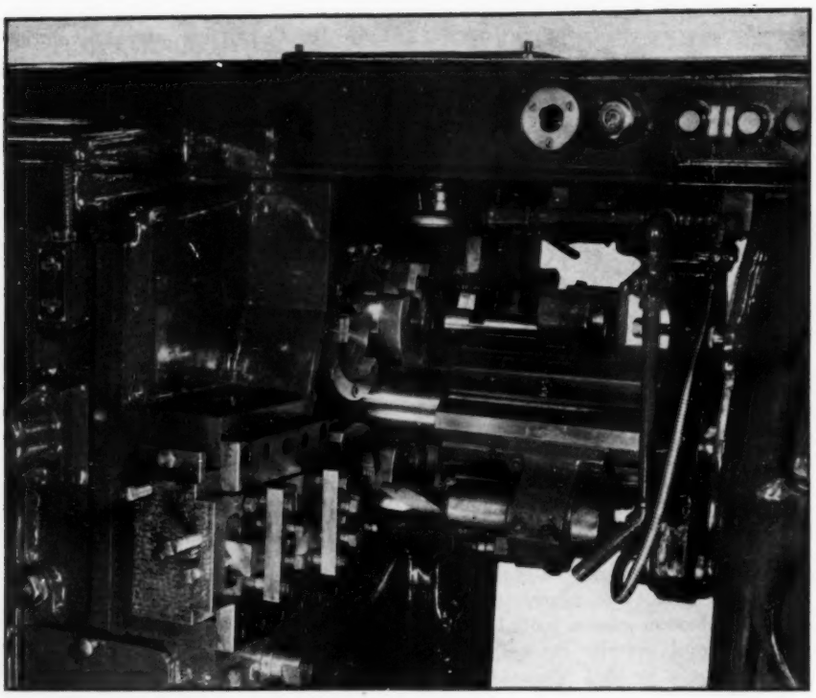
While the operator is chucking this piece, the tools are at work on the other spindles and at the end of the cycle the tools withdraw and the feed then is interrupted until the operator pulls a starting lever conveniently mounted in the operating position. When the starting lever is pulled, the spindle which has just been loaded is automatically engaged by the main drive motor and the spindle carrier indexes into the next operating position.

Since a great deal of the work that is handled by machines of this type will be cast iron, the massive slides are mounted vertically so that the chips and dust will not lodge on the guides. Each slide rests on hardened and ground alloy steel plates, a taper gib being provided for quick take-up of wear. Adjustment on the slide is provided for changing position of the tool in three directions. In order to simplify the mechanism the cross-slide cams and rollers are mounted directly behind the slide, thus eliminating a large number of levers, pins and studs. The entire tooling space of the machine is unusually open and accessible. Because of the manner in which the cross-slides are mounted and the absence in this space of cams, drums and levers, there is no projection that will interfere with the free flow of chips and coolant down into the pan, and each cutting tool is in plain sight.

Machines Steel Forgings

To meet the requirements for extreme power in handling steel forgings, the machine is made very massive with a very wide and deep pan, all of the castings in the machine being normalized before finish machining to avoid distortion.

There are two complete lubricating systems in the machine; one is a pump which furnishes lubricating oil through a filter to all portions of the gear section and the headstock of the machine, including the bearings for forming slides: the other a pump which delivers coolant to all of the cutting tools. An indicator, mounted at the operating position, indicates clearly whether or not lubricating oil is flowing. The operation of the machine need not be interrupted for the removal of chips, as



Close-up of tooling section on front or loading side of machine, showing accessibility of tooling and ample chip space

unusually large space is provided for the accumulation of chips and they can be cleaned out from the rear side of the machine without disturbing the operator.

In order to reduce the time required for set-up, the machine is so designed that by the removal of a few guards all cams are quickly accessible, and the space for the setting of tools is entirely free from obstructions.

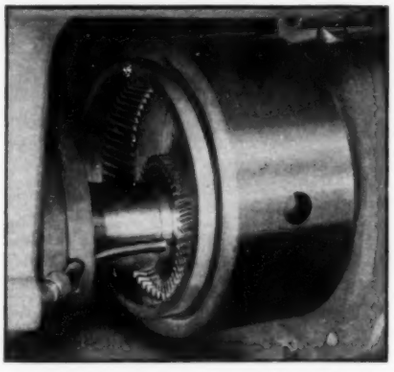
A start, stop and jog push-button station is mounted on each side of the machine within easy reach of the operator during set-up. The main slide of the machine is the well known "Gridley" main slide accurately ground so that tool holders can be clamped in any position and still maintain accurate alignment with the spindle in that position. The slide is made of forged steel, bronze bushed, and moves backward and forward on a heat-treated hardened alloy steel spindle carrier stem, so that alignment is always maintained between the end-working tools and the spindles.

The feed and speed change gears are mounted on the end of the gear section, readily accessible by the removal of a guard, and are interchangeable. The entire machine when operating is so guarded and enclosed that the operator is fully protected.

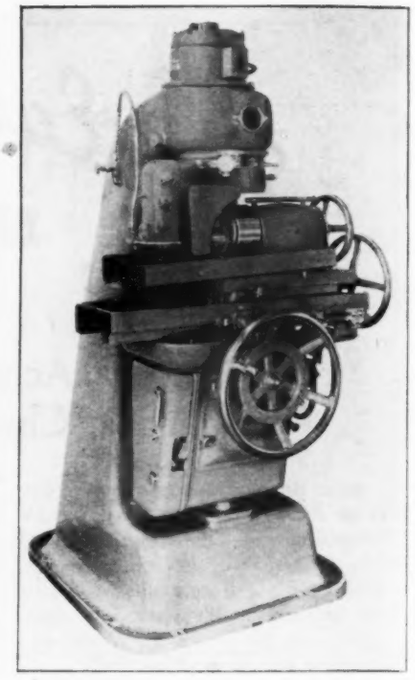
All shafts are mounted on anti-friction bearings and run in a flood of oil, all gears are of alloy steel heat-treated and recut after heat-treating in order to insure quiet operation. High-speed gears are cut with helical teeth. Heavy foundations, or means of leveling the machine, are not required.

National Broach Gear Crowning Machine

An automatic machine which crowns the teeth of internal transmission gears for automobiles has been developed by the National Broach & Machine Co., Shoemaker & St. Jean St., Detroit, Mich. It has been found that the bearing on the teeth should have a crowned surface so that small planet gears will not bear heavily on their edges under different conditions of torque on the main drive. This machine has been designed to crown the teeth to offset any possible misalignment of shafts.



Application of the "Burni-Shave" tool to internal transmission gears

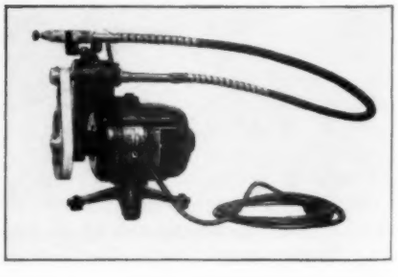


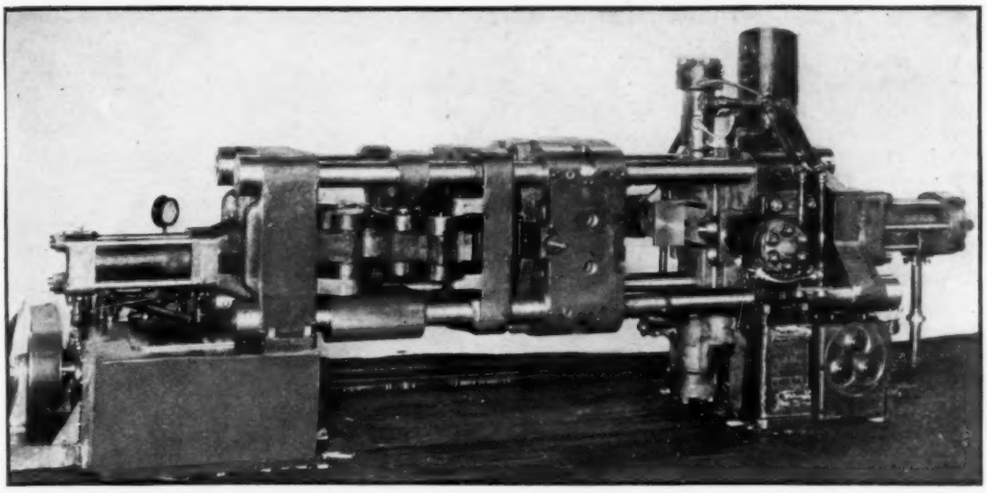
Eccentricity and index error are eliminated in the crowning process

"Crossed-axes" shaving is employed. Chordal thickness of the teeth varies 0.001 in. from the ends to the middle. No burnishing of the gears is required when finished on this machine, which can be set for a production rate of about 30 gears per hour. The machine is fully automatic, performing its various cycles of feed, cut and crowning.

Mall Flexible-Shaft Die-Sinker

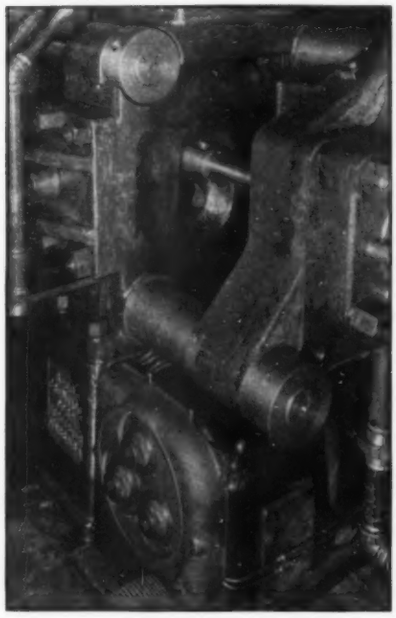
A ½-hp., continuous-duty, ball-bearing, countershaft-driven, flexible-shaft machine has been introduced by the Mall Tool Co., 7740 South Chicago Ave., Chicago, Ill. It is equipped with speed combinations for any particular grinding or cutting application, and extra wide speed variations from 850 to 14,000 r.p.m. may be secured. The machine may be fitted with rotary files or shaped grinding wheels for cutting hard or soft materials.





Left — Large Reed-Prentice brass die-casting machine, which develops pressure of 50,000 lb. per sq.in.

Below — Close-up view showing the operating or metal plunger end of the Reed-Prentice brass die-casting machine



Reed-Prentice Brass Die-Casting Machines

To meet the difficulties involved in die-casting brass and brass alloys, Reed-Prentice Corp., Worcester, Mass., has developed a high-pressure casting machine which is fully hydraulic. It is provided in two models, the 2G, which develops a pressure up to 10,000 lb. per sq.in., and the 8G of larger capacity, which delivers a pressure of up to 50,000 lb. per sq.in.

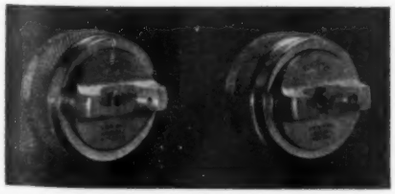
Two levers are used to operate the machines. Controls are interlocked and it is impossible to operate the metal plunger cylinder until the dies are securely closed. A safety pilot eliminates the danger of shooting metal when the dies are open. Dies can be provided for the automatic ejection of castings, and die plates are finished on all four sides for fitting core-pulling attachments.. Both sizes have die openings of 12 in.

The smaller machine has die plates of 32x37 in., with space between the bars of 18x21 in. Maximum and minimum die spaces of this machine are 24 in. and 8 in., respectively, and the weight of the machine is approximately 12,700 lb.

The larger machine, illustrated here, has die plates 39x42 in., with a 20x22-in. space between its tie-bars. Its maximum die space is 17 in. The adjustment of the movable die plate is 12 in. The larger machine weighs about 23,500 lb.

DeVilbiss Air Caps for Spray Guns

Two air caps for the MBC spray gun have been announced by the De Vilbiss Co., Toledo, Ohio. The No. 76 cap is for lacquers, primers and heavy-bodied synthetics in volume production. It has three auxiliary atomizing jets to produce a wide, straight-sided pattern.

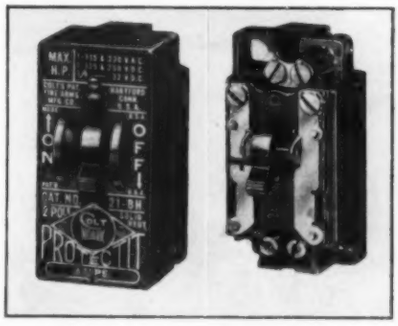


Left—DeVilbiss No. 54 air cap. Right —No. 76 air cap for heavy-bodied synthetics, primers and lacquers

The No. 54 cap is of the narrow-horn, twin-jet type and produces a wide, even spray without split, and is especially adapted for use with portable outfits and smaller industrial installations.

Colt "Protectit" Switch With Circuit Breaker

The Colt Patent Fire Arms Mfg. Co., Hartford, Conn., announces a line of 250-volt Colt-Noark "Protectits", a control device with automatic current overload protection. It is furnished in a "Coltrock" casing, and is adaptable for mounting on the cover plate of an outlet, box or directly on a wall or on machinery. Special casings can be supplied. The standard casing is 3⅛ in. long, 1½ in. wide and 1½ in. deep. The operating mechanism consists of a bimetallic strip which connects the switching member and its movable contacts with the handle. When an overload overheats the strip it bends and



Left—Colt-Noark "Protectit" circuit-breaker switch. Right—Showing how interchangeable heaters are held securely by the two brass nuts

releases the switch, breaking the current. These heater strips are supplied in various ampere ratings, depending upon the requirement of the switch.

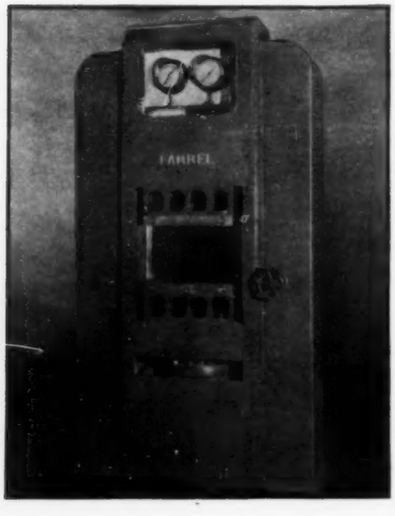
Farrel-Birmingham 100-Ton Forming Press

All components not required in the actual operation of the 100-ton press have been inclosed by the Farrel-Birmingham Co., Inc., Ansonia, Conn. Although designed especially for plastic and rubber molding operations, the press is adapted for other types of work. Its platens are 20 in. square with an opening of 12 in. between them.

The press has a self-contained hydraulic power unit. The variable-displacement pump and its motor are mounted on a steel bedplate over the top crosshead. This member also serves as an oil reservoir. Rolled steel slabs are used as tension members, the design dispensing with the usual tie-rods between the top and bottom crossheads. Steam connections are fitted into the upper and lower platens, and ventilated grids are interposed between the platens and crossheads to lessen heat transfer.

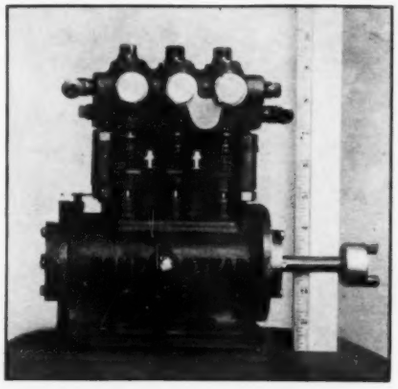
Opening and closing of one hand valve operates the press. Maximum pressure adjustment of the variable-displacement pump is made with a single manipulation of the control handwheel on the pump. This pressure adjustment requires no attention once it has been set.

Only one valve need be manipulated to control this 100-ton hydraulic press manufactured by Farrel-Birmingham. Its specialty is plastic and rubber molding, but is adapted to other work



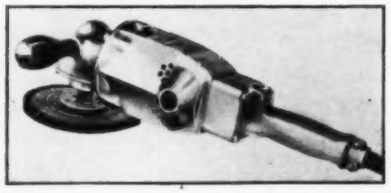
Triplex High-Pressure Plunger Pump

A small pump to handle fluids at relatively high pressure, and at the same time in small quantities, has been placed on the market by the Homestead Valve Mfg. Co., Coraopolis, Pa. This pump fills the gap between the mechanical lubricator type and the rotary centrifugal type. Depending upon the speed of the pump, the capacity may be varied from 15 to 120 g.p.h. The power required is small and is such that a ¼ hp. motor will operate the pump at 60 g.p.h. and 200 lb. pressure. It is a single-acting plunger type having three cylinders of ¾ in. bore and ⅝ in. stroke. The gears, crankshaft, connecting rods and cross-heads are entirely inclosed in a crankcase with splash lubrication. Pressures may range as high as 500 lb. per sq.in.

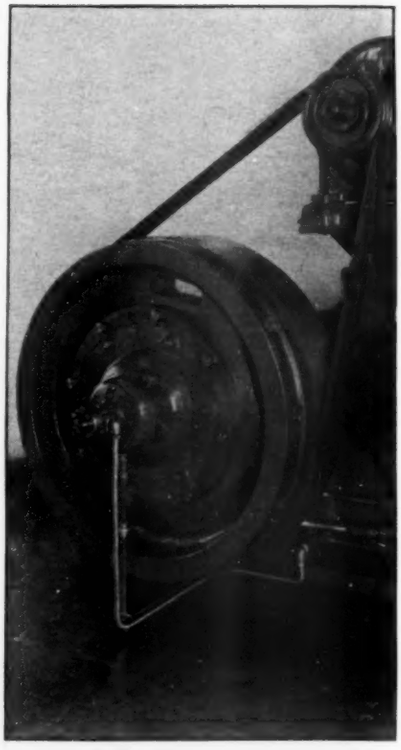


Black & Decker Portable Sanders

Lighter in weight, but more powerful and dust- and grit-proof are the line of portable sanders redesigned by Black & Decker Mfg. Co., Towson, Md. With proper balancing and smaller sizes of the new design, fatigue of the operator is reduced. Spiral-bevel gears are used in all models, and better ventilation reduces clogging and the danger of overheating the motor. There are three 7-in. models and a 9-in. sander.



Completely redesigned Black & Decker Portable Sander — lighter, smaller and more powerful



"Ajax" Hydraulic Clutch for Forging Machines

A hydraulic clutch for the "Ajax" line of heavy forging machinery, as an alternate to direct pneumatic-operated clutches, has been announced by the Ajax Mfg. Co., 3830 Lakeside Ave., Cleveland, Ohio. It was developed for a large automobile plant to meet specific requirements. The hydraulic clutch is of the multiple-disk friction type. No toggles, wedges or yokes are used to transmit the hydraulic pressure which acts directly upon the clutch plates. Compression springs retract the piston and disengage the plates when the pressure is relieved. A small, high-speed motor, individually driven or with power take-off from the motor of the forging machine, supplies the hydraulic pressure for the clutch, making the machine a self-contained unit. A ⅛-in. piston stroke and small volumetric displacement allow quick action in engaging and releasing. Clutch torque is controlled by the pressure setting of the pump.

"Pretty-Neat" Molded Drawing Board

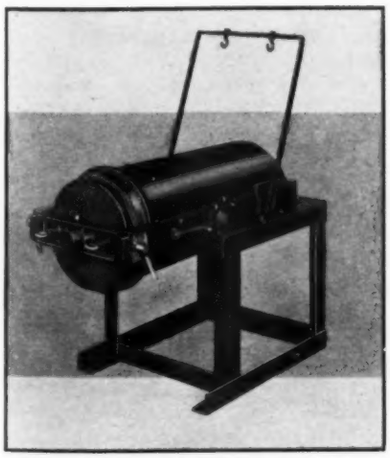
A compact drawing board for shop work is being manufactured by H. E. Twomley, 7154 Magnolia Ave., Riverside, Calif. It is made of molded

"Pretty-Neat" molded drawing board, showing how a triangle can be slid along the inner edges

material, and is fitted with spring clamps at the corners, to hold the paper. No thumbtacks are needed. No. T-square is required. A 45-deg. triangle is all that is needed for horizontal, perpendicular and diagonal lines. The board for 8½x11 in. paper (letterhead size) weighs less than one lb. Larger sizes are available.

Mercil Burnishing Barrel

In the Mercil Type burnishing barrel, announced by Hanson-Van Winkle-Munning Co., Mattawan, N. J., the barrel, gearing and motor are combined in one unit. The unit is fabricated by electro-welding. Operation at any angle is quiet and efficient, and the angle may be changed while the machine is running. The motor, gears and most of the cylinder are covered by a steel shell, making the apparatus splashproof. Safety guards are unnecessary. A motor control switch is mounted on the front of the frame. Notched plates on the right-hand trunnion bearing lock the barrel at the desired angle. A cover-lifting device and support facilitates handling the machine and the work.



Ingersoll "Zee Lock" Hollow Mill

Rigidly held, adjustable hollow-mill blades, which may be renewed at only a fraction of the cost of the complete cutter, are provided by the adjustable "Zee Lock" hollow mill announced by the Ingersoll Milling Machine Co., Rockford, Ill. The cutter blade is positively locked, adjustable in two directions and complete in itself. It is fitted into a forged and heat-treated alloy steel housing. Serrations to locate each

Ingersoll hollow-mill cutter for use on lathes, drills or boring machines

cutter blade are broached in the body. By reinserting the blades in the succeeding position, they will be moved forward and inwardly a few thousandths of an inch, and the cutter resized. This mill maintains accurate diameters with its rigid tooth lock, and a minimum of grinding is required.

Korfund Type T Seismo-Damper

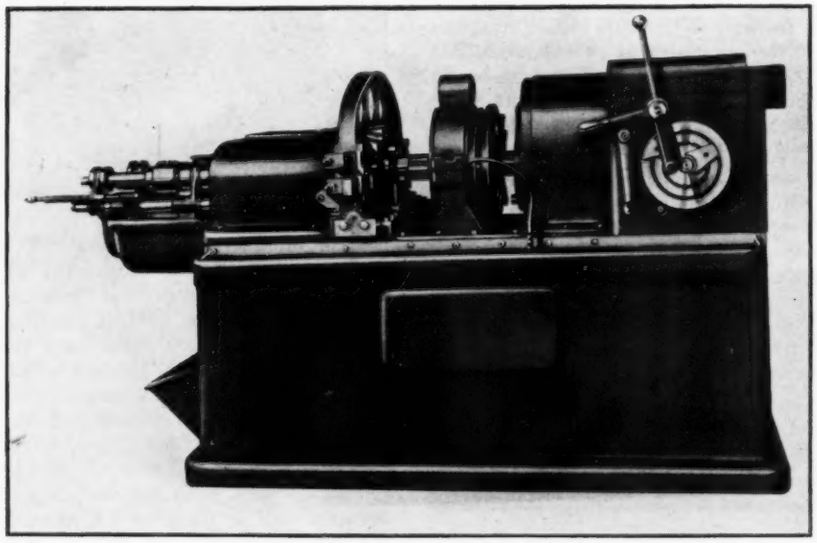
Vibration isolation for medium and light machinery is the function of the Type T "Seismo-Damper" announced by the Korfund Co., 48-15 32nd Place, Long Island City, N. Y. This device is built in sizes from 100 to 2,500 lb. capacity. The machine is directly supported by a T-iron separated from the base of two angle irons by natural

cork or other isolating material. The angle irons are firmly connected by bolts passing through the isolating materials and T-iron, but not touching it. Before installation these bolts are adjusted to produce a precompression of the isolating material to suit the machine load. Where the machine frame is light and must be supported at several points, the T-iron can be extended to form a continuous support between two or more of the Seismo-Dampers.

Niagara No. A-4 Inclinable Press

Another "Master Series" press has been added to the line of open-back inclinable presses built by the Niagara Machine & Tool Works, Buffalo, N. Y. The 4-in. main shaft is forged and ground. The press includes a quick-acting, six-point engagement clutch; a slide with a breech block die clamp and equal support for the die from center to front and center to rear; double gibs; motor drive on top; self-contained anti-friction backgear; compensating brake; and one-man inclining device equipped with anti-friction bearings.

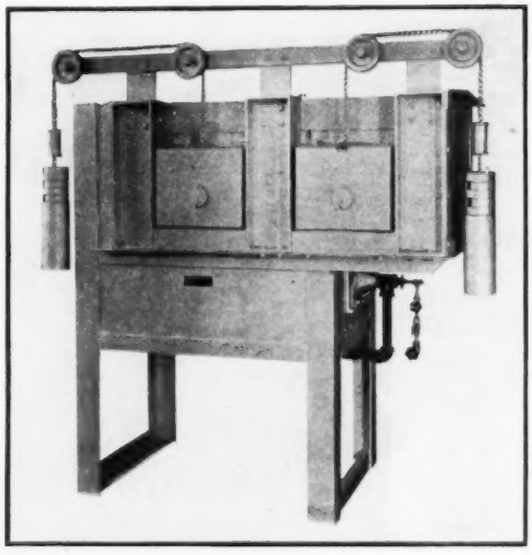
Windsor "Di-Matic" Automatic Screw Machine



Two non-indexing spindles with collets of 1¼-in. capacity are used on the "Di-Matic" Model A

Recently organized by a group of Vermont machine tool men, the Windsor Automatic Co., Inc., Windsor, Vt., announces its "Di-Matic" Model A, a simple and completely automatic screw machine. The machine has two non-indexing spindles of standard automatic type with draw-in collets of 1½-in. maximum capacity. Feed length is 6 in. End tools are placed in an indexing turret and the tools are brought to the work spindles alternately. A new type of indexing arm is used. It is actuated by a cam which allows "dwell" enough to feed out the stock in the spindles in turn. Because the weight to be turned over is small, this indexing is done easily and quickly. Each spindle has its own forming tool, finish forming tool, and cutting off tool mounted in a rigid frame and carried by the cross-slide.

The base of the "Di-Matic" is cast in one piece with the headstock. The heavy cross-slide is operated directly by a cam, eliminating backlash and making for accurate work. The machine is designed to perform as many as seven operations at once. Floor space required is 8 ft. by 3 ft., without stock reel. Weight is approximately 4,500 lb.



"P.D.M." twin-chamber preheat and heat-treating furnace offered in oil-burning and gas-burning types. It is shown equipped for burning oil

"Numberall" Stamp With Interchangeable Type

Quick changes of type secured by pressure of the operator's thumb makes the numbering stamp manufactured by the Numberall Stamp & Tool Co., 379 Huguenot Ave., Huguenot Park, Staten Island, N. Y., convenient for consecutive stamping of metal parts or stamping requiring many changes. The "Numberall" interchangeable type holder is furnished both in hand and press styles. The holder is furnished in all practical sizes, and different sizes of characters engraved on the same body can be used in the holder.

Numberall interchangeable type holder for use in power presses

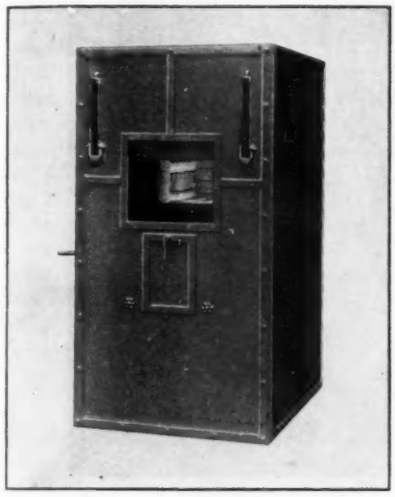
"P.D.M." High-Speed Hardening Furnaces

Developments in the design of high-speed hardening furnaces are announced by the Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia, Pa., in offering its "P.D.M." single- and twin-chamber models. The line is equipped for gas or oil-burners. The single-chamber model is usually used for production work in conjunction with a separate heat-treating furnace. The twin-chamber model consists of a high-heat chamber and a preheat chamber.

A large combustion chamber is built beneath the hearth of the high-heat chamber, and hot gases enter the heating chamber over a low bridge wall and completely surround the work. The preheat chamber in the twin-chamber model is heated by waste gases from the high-heat chamber. Bypass vents prevent overheating of this preheat chamber. Tight closing doors prevent air infiltration in both models.

"Hevi Duty" Furnaces

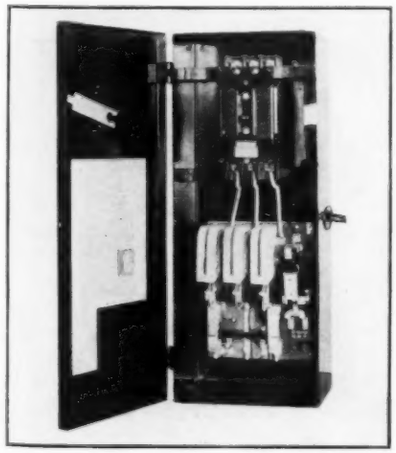
A line of box-type heat-treating furnaces with metallic resistors of Smith Alloy No. 10 for 2,400 F. has been



built by the Hevi Duty Electric Co., 4150 Highland Ave., Milwaukee, Wis. The line will operate with either oxidizing or reducing atmospheres. "Certain Curtain" atmosphere control prevents outside air from entering the furnace chamber. The metallic resistors have greater resistance than nickel chromium, allowing greater k.w. imput for increased production, and showing small resistance change over a long period of use.

General Electric Magnetic Combination Switch

A line of combination magnetic switches with maximum ratings of 25 hp. at 220 volts, and 50 hp. at 440 to 600 volts, has been introduced by General Electric Co., Schenectady, N. Y. Air circuit breakers, which can be reset by hand after tripping, instead of fused

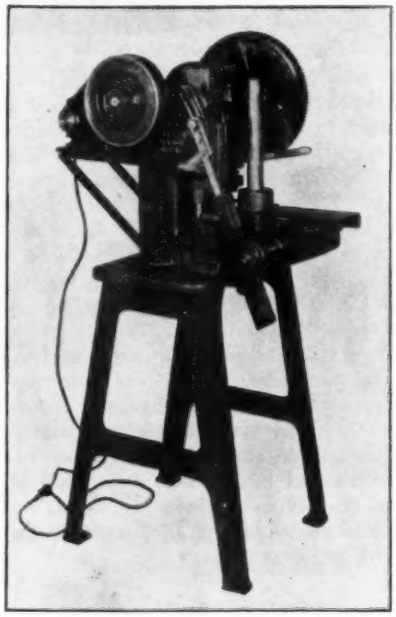


safety switches are used in this line of switches. The breaker operating handle is interlocked with the inclosing case door, and cannot be opened when the breaker is closed. The breaker can be locked either open or closed from the outside of the case.

This line parallels, but does not supersede the G-E line of similar ratings which incorporate a magnetic switch with overload relays for motor protection.

"Crimson Beauty" Press With Slicer Feed

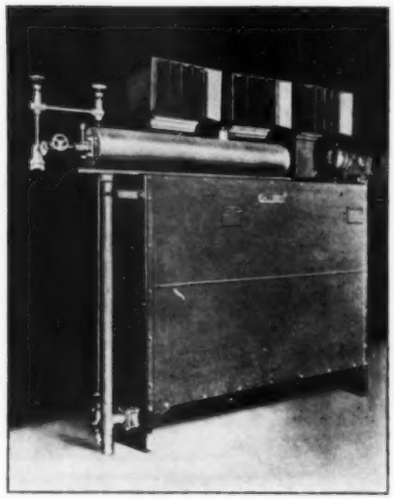
An entirely automatic high-speed press with slicer-feed attachment has been announced by the Perkins Machine Co., Warren, Mass. It is equipped with motor drive and with



special gearing for very slow feed. This Crimson Beauty Press is designed for light punch work, saves power costs and speeds up production wherever heavier equipment is not required.

York Air Conditioners for Industrial Use

A line of industrial air conditioner units, designed to meet a wide range of industrial air-cooling requirements at low operating cost, has been announced by the York Ice Machinery Corp., York, Pa. Models FB-500, FB-800, FB-1400 and FB2000 can be installed in any factory with or without distributing ducts. The units are of coil-type construction. Thermostats

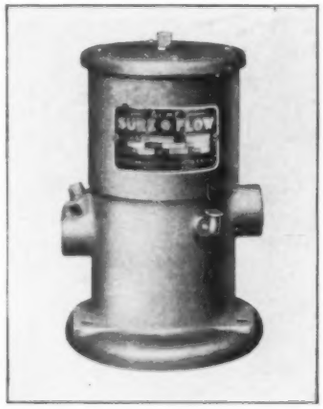


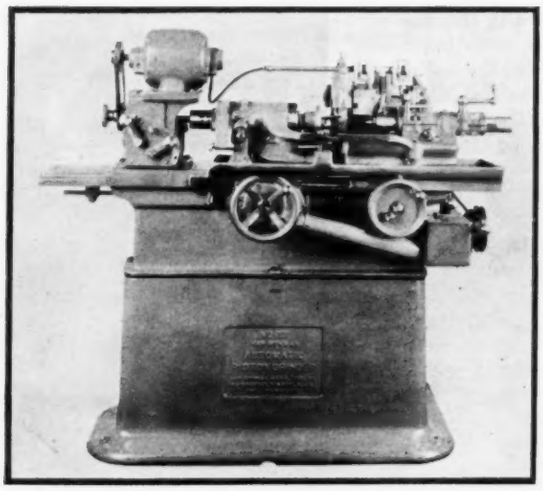
Large, three-outlet York air-conditioners. Models are built for high and low pressures

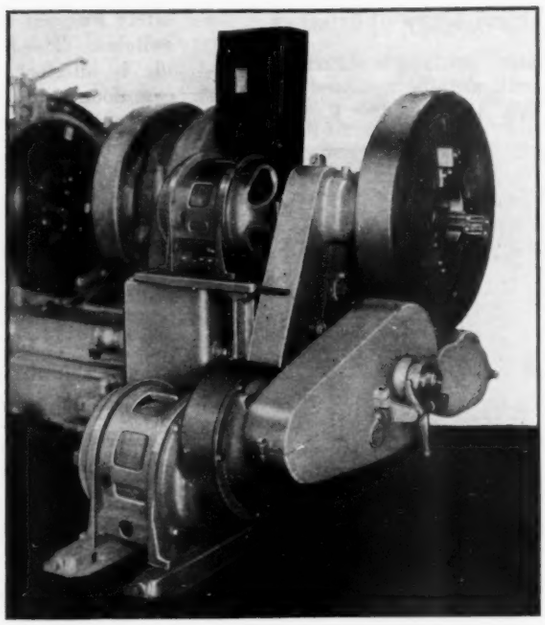
automatically control the room temperature at any desired level. The entire unit is enclosed in heavy steel, fully braced, which provides a rigid frame for supporting the fan assembly and cooling surface. Fans are of multi-blade, double-inlet design, and operate quietly. V-belt driven, they are readily adjusted to the air volume required for any specific requirement.

Acme "Sure Flow" 4-g.p.m. Pump

Requests made for a small, direct-motor driven centrifugal pump during the Machine Tool Show, resulted in the development of a 4-g.p.m. pump for coolants for lathes and other machines by the Acme Machine Products Co., Inc., Muncie, Ind. The pump is manufactured for both high- and low-pressure service. The low-pressure pump is powered with a 1/8-hp. motor, and the high-pressure unit is equipped with a 1/3-hp. motor. An adapter base for side-wall mounting is available.







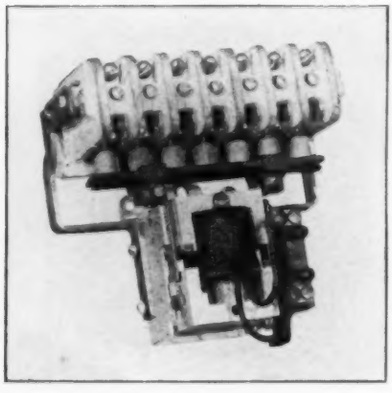
Above—Either straight or cam-ground pistons can be finished at high-speed on the Van Norman No. 101. Right—Landis drill-pipe threader with a slow speed for the "bucking-up" operation

Van Norman No. 101 Piston Grinder

A fast, heavy-duty machine for turning and grinding pistons has been announced by Van Norman Machine Tool Co., Springfield, Mass. This machine, the No. 101, finishes both straight and cam pistons. A shift of a lever converts the type of grinding from the one to the other. Increased spindle speeds and wheel feeds, and the machine's simplicity and ease of operation contribute to its speed of operation. The machine can be set up rapidly, and less time for chucking is required than usual. A number of speeds are available at the wheel- and work-heads. All ways are hand scraped, bearings are anti-friction and are designed for easy and accurate take-up for wear.

General Electric Multiple Magnetic Contactor

Intended for use either with small single-phase and polyphase a.c. motors, or as a flexible relaying device for complicated control systems, such as are used in machine tools, the multiple magnetic contactor, designated as Size O, announced by the General Electric Co., Schenectady, N. Y., is available with either normally open or closed contacts, or with a combination of both.



The contactor may be controlled remotely through pushbutton stations, limit switches or other pilot devices. Any two forms of the contactor may be combined and mechanically interlocked either vertically or horizontally. The self-contained device is easily installed and can be mounted either as an open-type contactor or as an inclosed switch, for it is also obtainable with inclosing cases.

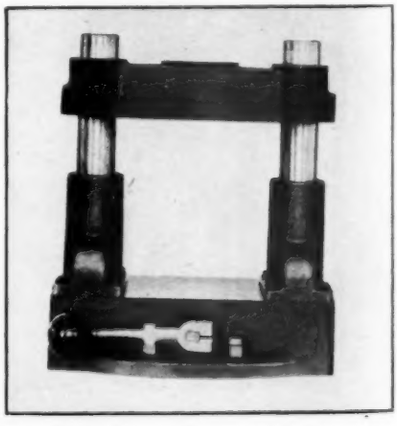
Landis Pipe Threading, "Bucking Up" Unit

A dual-speed arrangement has been developed by the Landis Machine Company, Waynesboro, Pa., for its pipe threading and cutting machine with receding-chaser diehead. This equipment pulls the joints tight on drill pipe used in oil fields. Two separate motors are used, one for the thread cutting and the other to perform the "bucking up" required in this type of work. A three-station push-button control is used. One station starts the threading motor, the second operates the slow speed "bucking up" motor and the other station stops the machine. Both motors cannot be started simultaneously. A friction clutch drives the machine at threading speeds, and a tooth clutch transmits power from the low-speed motor for the "bucking up." Separate clutch levers are provided to engage the proper clutch, but these cannot be operated simultaneously.

"Esco" Drill Jig Line Is Expanded

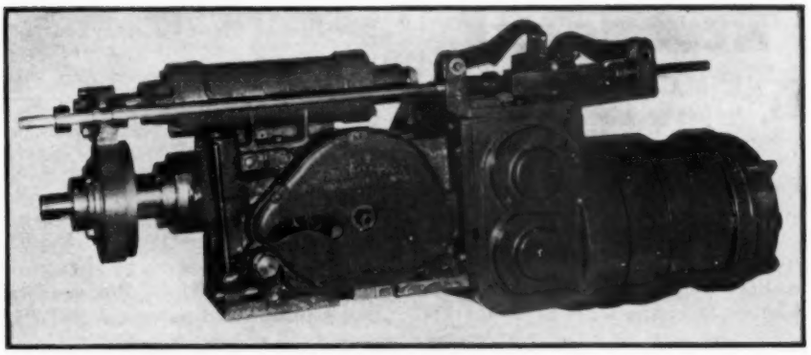
Six new styles in 40 sizes have been added to the line of drill jigs made by the Esco Engineering Service Co., 1922 Linwood Ave., Toledo, Ohio. The locking mechanism of double eccentric gears is fitted under each guide post, increasing work holding pressures without increasing jig operating pressures. Over-all dimensions have been reduced without corresponding reductions in work areas. Guide post diameters have been increased to 1¾ in.

"Esco E" style, size No. 20, drill jig with 4x6 in. working area on base



Millholland Improved No. 3 Tapping Unit

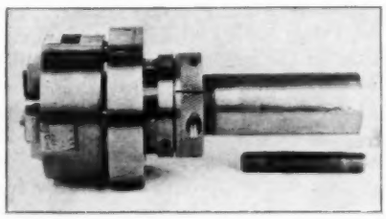
Equipped with either a 2-, 3- or 5-hp. motor, the improved No. 3 automatic tapping unit is offered by the Millholland Sales & Machine Co., Indianapolis, Ind. It taps six ½ in.-20 threads in steel, or six ⅝ in.-11 threads in malleable iron. The unit is equipped with positive reversing clutches to reverse at 500 r.p.m. and positive toggle lock on the reversing clutch. Shockless reversing is provided by adjustable friction in the hub of the main driving gear. The improved unit has the same mounting dimensions as the No. 3 Millholland drilling unit, and can be mounted at any angle.



Millholland No. 3 Automatic Tapping Unit equipped with either 2-, 3- or 5- hp. motor. The unit has a 3-in. stroke

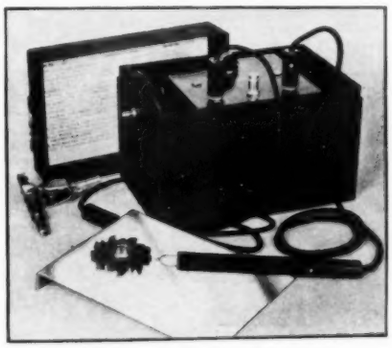
"H & G" Insert-Chaser Diehead for Pipe

A line of "H & G" insert-chaser dieheads has been developed by the Eastern Machine Screw Corp., Truman & Barclay Sts., New Haven, Conn., for cutting taper pipe threads. The chasers recede at a definite rate until the proper length of thread is cut. Then the diehead opens, withdrawing the chasers. Positive action of the diehead governs the actual taper, holding pipe threads to the specifications prescribed. Chasers cut at the chamfer, leaving no visible marks. A rotating opening cam between the back plate of the head and the knurled adjusting nut on the shank of the diehead produce the taper action. These dieheads may also be equipped with a chamfering and reaming tool for work calling for this finish.



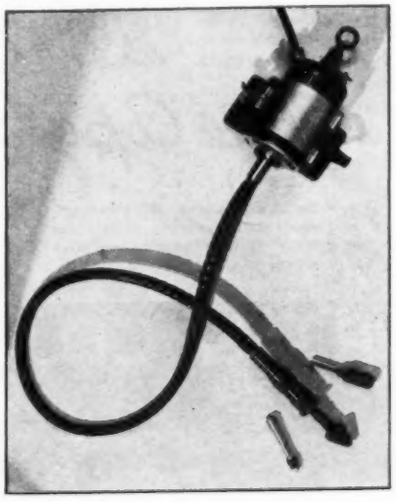
Electro-Graphic Metal Graver

An electrically actuated tool for marking, lettering or engraving on metal has been developed by the Electro-Graphic Graver Co., Factories Bldg., Toledo, Ohio. The electrode, in an insulated stylus handle, has a reciprocating motion which is actuated when the electrode comes in contact with the work, serving as a rapid interrupter of the current. It is made of Tungsten alloy. The a.c. type operates from standard 110-volt, 60-cycle outlets. Unlimited current stages may be chosen with a vernier adjustment. The d.c. type operates from any power source with proper voltage control. The graver is housed in a steel carrying case, 5x5x8 in. It marks on lead and lead alloys, and metals of any hardness up to and including the tungsten-carbide group.



Jarvis "Speedwitch" Flexible-Shaft Grinder

A 1/3-hp., 18,000-r.p.m. motor powers a flexible-shaft grinder introduced by the Charles L. Jarvis Co., Gildersleeve, Conn. It is known as the "Speedwitch." The handpiece is ball bearing, equipped with precision bearings for thrust and radial load. It can be used with ¼-in. collets. It is built with a ball bearing motor, and takes grinding wheels up to and including 2 in. Because of its flexibility it can be used in places hard to get at. It is suited to mold, metal pattern and die work, and for cleaning welded joints. It is provided with a combination bench and overhead suspension base.



DeVilbiss Paper Cup for Spray Painting

A one-quart paper paint cup for use with its spray-painting equipment has been developed by the DeVilbiss Co., 269 Phillips Ave., Toledo, Ohio. As the color is changed in painting, the cup can be inexpensively thrown away and a new paper cup installed. It is sturdily made with flanged upper edge and has a metal bottom. Only a slight bending of the fluid tube is needed to install the paper cup.

NEW BOOKS

AMERICA MUST ACT—*By Francis Bowes Sayre, Assistant Secretary of State. 80 pages, 5x8 in. Bound in cloth boards. Published by World Peace Foundation, Boston and New York. Price 75 cents.*

Secretary Sayre presents the case for world trade and reciprocal trade treaties in this small volume which is Number 13 in the series of World Affairs Books. Even the most confirmed isolationist should find food for thought in this statement of the opposite viewpoint. Machinery builders, because of their keen interest in foreign sales, will be interested in Secretary's Sayre's argument.

THE BOOK OF STAINLESS STEELS.—*Edited by Ernest E. Thum, Editor of* Metal Progress. *Second Edition. 813 pages, 6x9 in. Published by the American Society for Metals, 7016 Euclid Ave., Cleveland, Ohio. Price, $5.*

The consumers standpoint rather than that of the producer is the basic approach to compilation of material for this book. Now in its second edition, the work presents information on fabrication, properties and utilization of heat- and corrosion-resisting alloys of the stainless-steel and stainless-iron types. Each chapter is written by a recognized authority in his field.

Rewriting and adding to the first edition, have increased the material appearing in the second by approximately 25 per cent. Twenty-seven chapters are new or have been rewritten, and corrections have been made throughout the pages to reflect advances in practice since publication of the first edition. New material includes a chapter on the arc welding of high-chromium irons, a number of chapters on various types of castings, and an index of trade-named alloys produced in the United States. The scope, presentation and indexing of this book should commend it to any production executive or engineer likely to encounter the use of stainless steel or iron in his work.

THE METAL—IRON—*By H. E. Cleaves and J. G. Thompson, 574 pages, 6x9 in., 113 illustrations, 95 tables. Blue clothboard covers. Published by the McGraw-Hill Book Company, 330 W. 42nd St., New York, N. Y. Price, $6.*

This monograph, "Alloys of Iron Research," has been prepared at the National Bureau of Standards. The book is a review of available information on the preparation and properties of high-purity iron. Part I contains three chapters on laboratory and commercial production of electrolytic iron.

The nine chapters in Part II give concise but comprehensive information on the structure and the thermal, electric, magnetic, chemical and mechanical properties of high-purity iron. Heat-treating and aging are also discussed.

PRINCIPLES OF HEAT TREATMENT—*By M. A. Grossman, Director of Research, Illinois Steel Company. 147 pages, 6x9 in. Illustrated. Bound in cloth boards. Published by American Society for Metals, Cleveland, Ohio.*

In the foreword the author says, "The principles of heat treatment are simple, and they all revolve around the

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circumstance that steel after being heated to a high temperature becomes hard if cooled rapidly, and becomes soft if cooled slowly, and the further circumstance that if hard it may be softened by reheating. There are, it is true, a few details—but they are the book."

The text is that of five educational lectures on the principles of heat treating delivered before the A.S.M. at its meeting in Chicago, September 30-October 4, 1935. The photo-micrographs, of which there are many, are excellent. The shop views, on the contrary, are very poor. One clever device used is the inclusion of the temperature scale and a Rockwell hardness dial with the photo-micrograph to give all the facts in one illustration.

For those who are a little hazy on the basic principles of heat treating this volume is unhesitatingly recommended as being clear, simple and concise.

—◈—

ENGINE BEARING LOADING—*By William Samuels. 112 pages, 6x9 in. Clothbound binding. Illustrated. Published by Edwards Bros., Inc., Ann Arbor, Mich. Price $3.*

In this volume the author's aim has been to supply a method of engine bearing load calculation which avoids the objections to those which now prevail. The procedure presented has been in use two years and offers a quick means of computing loads that will give uniform and reliable results.

While the author's investigation was based primarily on problems arising in the automobile industry, the principles he sets forth apply to marine and stationary engines as well. Careful attention is given such factors as lubrication, counterbalancing and the effect of *V* construction.

The 29 diagrams, which illustrate the work are contained in a separate booklet held in a pocket at the back of the main volume, an arrangement which makes it possible to turn to them whenever they are referred to in the text.

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TECHNICAL AERODYNAMICS—*By Karl D. Wood. 330 pages, 6x9 in. 300 illustrations, 41 tables. Blue cloth board covers. Published by the McGraw-Hill Book Company, 330 W. 42nd St., New York, N. Y. Price $3.50.*

The text of this first addition has been used in mimeographed form as a textbook for college courses in aerodynamics. The book emphasizes the fundamental principles of mechanics and hydrodynamics rather than technical details of construction and operation. The book is divided into eleven chapters and eight appendixes. At the end of each chapter are given problems to which answers are supplied.

Among the important subjects discussed in the various chapters are properties of air, air foil characteristics, parasite drag, engine and propeller characteristics, airplane performance and performance estimation. Other sections deal with longitudinal, lateral and directional stability, special flight problems, model testing and flight testing, and hull and float characteristics for seaplanes.

The eight appendixes contain all the tables, charts, diagrams, formulas, figures and photographs necessary to the text. Four pages of notations give the various symbols and their definitions as used in aerodynamics.

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TRADE PUBLICATIONS

A.S.T.M. Standards. The complete 1936 index of the 793 Standards and Tentative Standards of the American Society For Testing Materials is available at the society's headquarters, 260 South Broad St., Philadelphia, Pa.

Abrasives. Gardner Machine Co., Beloit, Wis., has issued a booklet on the abrasive products, including their "Wire-Lokt" wheels and wheel dressers.

Cutting Speeds. Conversion tables for cutting speeds, as published in *American Machinist* from time to time, have been reprinted in a folder by Firth-Sterling Steel Co., McKeesport, Pa. Cutting speeds from 15 to 550 ft. per min., using the newer cutting materials, are given.

Duplicators. Clearing Machine Corp., 6499 West 65th St., Chicago, has published a bulletin describing its new duplicator attachment for milling machines. Accurate to 0.001 in., this device needs no trained operator to cut dies and molds.

Electrical Controls. Struthers Dunn, Inc., 139 North Juniper St., Philadelphia, Pa., has published a 28-page catalog of relays, timing devices, thermostats, pots and ladles, resistors, thermal links and insulators.

Gear Finishing Process. Michigan Tool Co., 7171 East McNichols Rd., Detroit, Mich., has issued a folder on the "Michigan" gear finisher. The leaflet is entitled "Automatic Accuracy."

Gear Lapping Machines. The Hutto Engineering Co., Inc., 515 Lycaste Ave., Detroit, has issued a bulletin on accurate production gear lapping for spur, helical and herringbone gears. The inclined axis principle is described in detail.

Grinders. Types 75 and 85 of the "Bridgeport" heavy-duty knife and face grinders are described in the 8-page bulletin No. 78 of the Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.

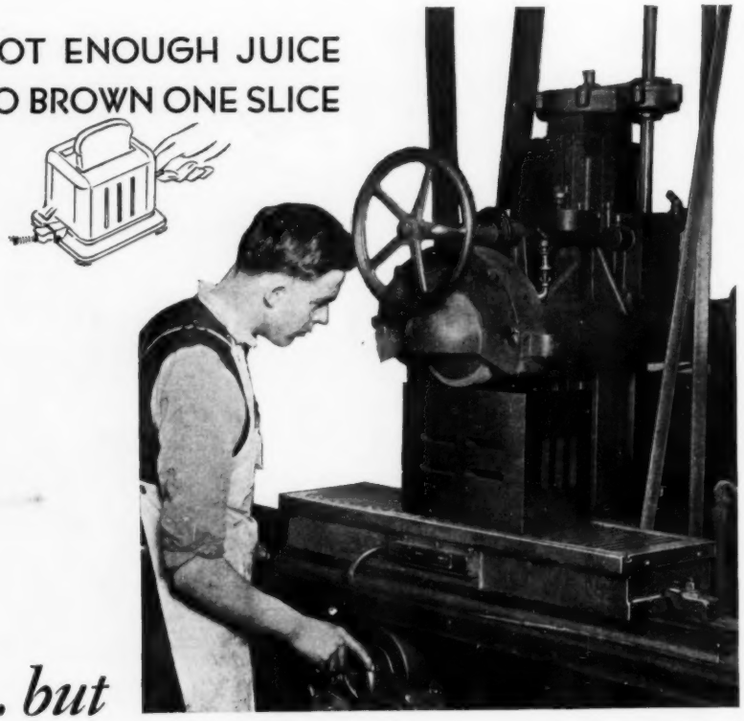
Hobbing Machines. Gould & Eberhardt, Irvington, N. J., have issued bulletin No. 214 on Cone worm-gear hobbing machines. The bulletin briefly describes the theory of worm gears and shows detail of tool setting on the machine of their manufacture.

Industrial Health. Four important papers and discussions on dust control, health hazards and employer responsibility have been reprinted by the American Foundrymen's Association, 222 West Adams St., Chicago. The papers were presented last August.

Lapping Machines. The hydraulically reciprocated honing and lapping machine of the Hutto Engineering Co., Inc., 515 Lycaste Ave., Detroit, is described in their bulletin on the MH 1800-H. Internal honing of long bores to close tolerances and under variable speed conditions is a specialty of the machine.

Lathe Controls. A catalog sheet describing the direct length-reading dial, which is readily attached to all sizes of Monarch lathes, has been issued by the Monarch Machine Tool Co., Sidney, Ohio.

NOT ENOUGH JUICE TO BROWN ONE SLICE



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